CYNGOR CEFN GWLAD CYMRU
COUNTRYSIDE COUNCIL FOR WALES

SITE OF SPECIAL SCIENTIFIC INTEREST CITATION

GWYNEDD **CADAIR IDRIS**

Date of Notification: 1957, 1977, 1981, 1982 2002

National Grid Reference: SH711130

O.S. Maps: 1:50,000 Sheet number: 124
1:25,000 Sheet number: SH60NE, SH61SW & SE, SH70 NW, SH71SW, SE, NW & NE

Site Area: 5493ha

Description:

Cadair Idris, a large upland site just to the south of Dolgellau, is of special interest for biological, geological and geomorphological features. The summit of Cadair Idris rises to 893 m, there are corries, summit ridges, steep scree slopes and cliffs found on the massif itself. On the eastern side there is the large U-shaped valley, which contains Tal-y-llyn. On the western side of the site there is a long steep sided ridge running from Crag Las to Mynydd Pennant, a large basin lies to the south of the summit. The special biological features of the site include blanket bog, wet and dry heaths, lichen/bryophyte heath, tall herb and fern ledges, vegetated natural rock exposures, standing water, broadleaved woodland, calcareous, acid and marshy grassland, flushes and springs. The site is also of special interest for its assemblage of higher plants, lichens, bryophytes and montane invertebrates. Nine higher plants are of special interest in their own right as is the slender green feather moss *Hamatocaulis vernicosus* and an edge of range lichen species. Also of special interest are populations of the marsh fritillary butterfly *Eurodryas aurinia*, Welsh clearwing moth *Sinathedon scoliaeformis* and lesser horseshoe bat *Rhinolophus hipposideros*.

Geological/geomorphological background

Lower Palaeozoic sedimentary and igneous rocks of Ordovician age dominate the bedrock geology of the Cadair Idris massif. The igneous assemblage comprises extrusive basic and acid volcanic rocks, including pillow lavas and ash-flow deposits, together with a variety of intrusive rocks such as dolerites and microgranites. Interbedded with the igneous rocks are mudstones, fine sandstones and, on the north-facing scarp of Cadair Idris, an oolitic ironstone which was worked locally as a source of low-grade iron ore. Locally superimposed upon the bedrock geology are hummocky glacial deposits (moraines) which were deposited during the last of several major phases of ice-sheet glaciation that culminated approximately 18,000 years ago. This glaciation caused deep dissection of the landscape, creating an impressive assemblage of landforms including cirques and U-shaped valleys. Post-glacial times witnessed the development of alluvial fans and screes, some of which are stratified, whilst glacial oversteepening of the southern flank of the Tal-y-llyn Valley resulted in a major landslip that dams the valley at the south-western end of the lake.

GEOLOGY

The Cadair Idris massif provides excellent exposures through a thick succession of bimodal acid-basic volcanic rocks of Llanvirn-Caradoc (Ordovician) age. Such bimodal volcanic successions are characteristic of the marginal basin environment which existed in parts of Wales during Lower Palaeozoic times. The site incorporates a well-exposed south to south-easterly-dipping succession of volcanic and associated sedimentary rocks, many component units of which show considerable lateral variation. The varied volcanic products consist predominantly of basic lavas and related pyroclastic rocks in the lower part of the sequence. Higher in the sequence acid lavas and tuffs predominate. Of particular importance are exposures of a thick granophyre sheet which evidently broke surface to form an effusive flow. This large site is a classic locality for the study of the palaeo-volcanic rocks of Wales.

GEOMORPHOLOGY

The area of Cadair Idris and Tal-y-llyn is outstandingly important for glacial and periglacial landforms. It contains a number of glacial and nivation cirques, including Cwm Cau which has been described as the finest cirque in Britain. This cirque shows a very clear relationship to geological structure and opens out onto the Tal-y-llyn Valley, a classic U-shaped valley developed along the structural weakness of the Bala Lineament. In addition to large-scale features of glacial erosion, the area is also renowned for a range of depositional landforms associated with mass movement and periglacial processes. Most spectacular of these is the bar impounding Tal-y-llyn, formed by a huge landslide from Graig Goch. The Tal-y-llyn Valley also contains very fine examples of stratified screes, well-exposed near Maes-y-pandy. Other periglacial interests include protalus ramparts, notably at Graig-y-llyn, and a large debris fan or blockstream near Bwlch Llyn Bach.

BIOLOGY

Cadair Idris is one of the most southerly high mountains in the UK, and many montane/upland species reach their southerly limit in the UK here. The spectacular cwms, boulder fields and scree slopes support vegetation communities in the crevices, on ledges and rocks, which are important nationally and in some cases, internationally. On the floor of the cwms are five oligotrophic (nutrient poor) lakes, namely Llyn y Gadair, Llyn Gafr, Llyn Cau, Llyn Arran and Llyn Cyri. Of these five lakes most information has been gathered on Llyn Cau, not as much is known about the other four lakes.

Llyn Cau has very clear water with a distinctive blue colour. The nitrate concentrations are relatively high for an upland Welsh lake. The slightly acidic waters of this lake support a naturally limited flora and fauna, including microscopic algae (diatoms), such as *Achnanthes marginulata, A. minutissima, Tabellaria flocculosa, Cyclotella comensis, Eunotia exigua,* and *Peronia fibula*. The microscopic crustaceans *Alonopsis elongata, Eubosmina longispina, Diaphanosoma brachyurum* and *Cyclops abyssorum* are the dominant species in the zooplankton. Invertebrates recorded include the leeches *Glossiphonia complanata* and *Erpobdella octoculata* and larval stages of a small number of caddis and crane fly species. In particular, the acid tolerant, predatory net spinning caddis *Polycentropus flavomaculatus* was recorded in the lake. Llyn Cau contains brown trout *Salmo trutta fario*.

The flora of Llyn Cau is typical of a cold water, nutrient poor acid lake in western Britain. The

quillwort *Isoetes lacustris* is found in abundance at Llyn Cau, with frequent intermediate water-starwort *Callitriche hamulata*, and shoreweed *Littorella uniflora*. Bulbous rush *Juncus bulbosus var. fluitans* is especially abundant adjacent to inflowing streams. The boulder-dominated lakeshores are covered with growths of liverworts and mosses. Other aquatic plants which have been found in abundance include bog pondweed *Potamogeton polygonifolius* in Llyn Gafr, alternate water-milfoil *Myriophyllum alterniflorum*, and floating bur-reed *Sparganium angustifolium* from Llyn Cyri.

The characteristic bright green of the parsley fern *Cryptogramma crispa* with few associated plants can be seen on the more acid crags and scree slopes all over Cadair Idris but it is particularly visible around Llyn Cau. More lush vegetation is also to be found on the ledges and acidic rocks inaccessible to sheep, with abundant great wood-rush *Luzula sylvatica*, bilberry *Vaccinium myrtillus*, heath bedstraw *Galium saxatile* and the wavy hair grass *Deschampsia flexuosa*. In amongst a deep cushion of mosses such as *Rhytidiadelphus loreus, R. squarrosus, Hylocomium splendens* and *Sphagnum capillifolium*; wood-sorrel *Oxalis acetosella*, broad buckler fern *Dryopteris dilatata*, hard fern *Blechnum spicant*, and foxgloves *Digitalis purpurea* can be found.

Where the soils are slightly deeper and more acidic on the more shaded slopes abundant lemon-scented fern *Oreopteris limbosperma*, and hard fern, are found with wood-sorrel, tormentil *Potentilla erecta* and heath bedstraw.

The more basic rock outcrops, which are found in various places around the mountain, including in the crags at Llyn Cau, at Llyn Arran and at Llyn Gafr, have a more lime loving flora. Maidenhair spleenwort *Asplenium trichomanes*, green spleenwort *A. viride* and brittle bladder fern *Cystopteris fragilis* are found in the crevices on these rocks. Lush tall-herbs grow on the basic ledges around Cwm Cau. The plants found here include great wood-rush, water avens *Geum rivale*, wild angelica *Angelica sylvestris*, and viviparous sheep's-fescue *Festuca vivipara*, with lesser meadow-rue *Thalictrum minus*, opposite-leaved golden-saxifrage *Chrysosplenium oppositifolium* and lady's-mantle *Alchemilla glabra*. Also found on these base rich crags is the nationally rare Welsh eyebright *Euphrasia cambrica* and the nationally scarce Welsh poppy *Meconopsis cambrica*. Regionally rare species occur here, plants such as moss campion *Silene acaulis*, alpine saw-wort *Saussurea alpina*, common juniper *Juniperus communis*, purple saxifrage *Saxifraga oppositifolia*, and the scurvygrass *Cochlearia pyrenaica ssp. alpina*. The clubmosses, fir clubmoss *Huperzia selago* and lesser clubmoss *Selaginella selaginoides*, starry saxifrage *Saxifraga stellaris*, mossy saxifrage *S. hypnoides*, and wild thyme *Thymus polytrichus* are also found on these species rich ledges and crevices.

On the slopes above the woodland and the mountain wall there is a much greater prevalence of heather *Calluna vulgaris* and dwarf shrub-dominated vegetation. Heather with bilberry, crowberry *Empetrum nigrum*, wavy hair grass and the large mosses *Hypnum jutlandicum*, *Pleurozium schreberi*, and *Dicranum scoparium* are widespread and often extensive. This vegetation occurs in many areas including on Mynydd Pennant, Mynydd Cedris, and above Coed Meriafel. On the slopes of Mynydd Pencoed, Mynydd Dol-ffanog and on the upper slopes and plateau of Cadair Idris itself, the heath becomes dominated by bilberry. Heather with western gorse *Ulex gallii* occurs on the dry south-facing slopes of Mynydd Moel and the Ystrad-gwyn. A mixture of heather and bell heather *Erica cinerea* with tormentil occurs across the site, sometimes with a high cover of grasses such as sheep's fescue *Festuca ovina* and mat-grass *Nardus stricta*. The nationally rare hairy greenweed *Genista pilosa* occurs in some of these

heaths.

Patches of the regionally rare stiff sedge *Carex bigelowii* with woolly hair moss *Racomitrium lanuginosum*, sheep's-fescue and bilberry occur on the summit plateau. This type of vegetation is rare this far south and indeed here the stands are small and fragmented with very little moss. The regionally rare dwarf willow *Salix herbacea* has been recorded from the summit ridge and occurs here near its southern most limit in Britain. The alpine lichen *Thamnolia vermicularis*, which is more commonly found in Scotland, is a local speciality on this area of Cadair Idris. Stunted heather, woolly hair moss and wavy hair grass, together with the lichens *Cladonia uncialis* and *C. arbuscula*, are also found growing together in these exposed conditions. The wind-pruned heather heath, which is found on Cadair Idris is very rare in Wales.

On the damper north-facing slopes in the upper reaches of the crags above Llyn Cau and on Mynydd Pencoed, a damp bryophyte and liverwort-rich heath is found. Liverworts typical of this very local community such as *Herbertus aduncus, Scapania gracilis, Anastrepta orcadensis* and *Diplophyllum albicans* occur under the heather together with abundant *Sphagnum capillifolium*.

The more widespread wet heaths characteristically include frequent cross-leaved heath *Erica tetralix*, with purple moor-grass *Molinia caerulea*, tormentil, heather and deergrass *Trichophorum cespitosum*.

Where the peat is deeper, along the ridge top at Mynydd Fron-fraith, in patches on Mynydd Pencoed and on the upper slopes of Mynydd Moel, areas of blanket bog occur, with frequent tussocks of hare's-tail cottongrass *Eriophorum vaginatum* in combination with heather and other heath plants. On some degraded areas the heather has disappeared and left the hare's-tail cottongrass, which provides a more or less continuous cover.

There is also widespread but patchy development of blanket bog dominated by hare's-tail cottongrass, with deergrass, heather, cross-leaved heath, and abundant purple moor grass. This vegetation occurs from the lower flanks of the site at Cross Foxes right up to some of the upper slopes on Mynydd Pencoed and by the side of Nant Cadair and Llyn Cau. Bog asphodel *Narthecium ossifragum*, rosettes of round-leaved sundew *Drosera rotundifolia*, and carpets of the mosses *Sphagnum papilliosum* and *S. capillifolium* add diversity to this vegetation.

On the lower slopes are areas of purple moor-grass-dominated mires. Purple moor-grass with tormentil is widespread on the common land at Tir Stent, fragmented patches extending south into the Gwerngraig area and along the northern edge of the site above Dolgellau. Cross-leaved heath is abundant in patches but also species such as wild angelica, marsh thistle *Cirsium palustre*, greater bird's-foot-trefoil *Lotus pedunculatus* and Devil's-bit scabious *Succisa pratensis* occur frequently.

Where the soil is less acidic, purple moor grass is found with marsh hawk's-beard *Crepis paludosa*, meadowsweet *Filipendula ulmaria*, common sedge *Carex nigra*, canation sedge *C. panicea*, devil's-bit scabious and tormentil. In these areas, sharp-flowered rush *Juncus acutiflorus* is abundant with plants such as common knapweed *Centaurea nigra*, marsh-marigold *Caltha palustris*, yellow-rattle *Rhinanthus minor*, fairy flax *Linum catharticum* and common bird's-foot trefoil *Lotus corniculatus*. In other areas of purple moor grass, sedges are more abundant with tawny sedge *Carex hostiana*, flea sedge *C. pulicaris*, star sedge *C. echinata*, common sedge and carnation sedge occurring with equal dominance.

There are small areas of species rich acid grassland on Tir Stent in which sedges frequently occur including spring-sedge *Carex caryophyllea*, pill sedge *Carex pilulifera* and pale sedge *Carex pallescens*. Other species found here are fairy flax, common bird's-foot trefoil, devil's-bit scabious and harebell *Campanula rotundifolia*.

Several notable species occur in these mires and especially on Tir Stent. There is a plethora of orchids such as small-white orchid *Pseudorchis albida*, greater butterfly orchid *Platanthera chlorantha*, lesser butterfly orchid *P. bifolia*, fragrant orchid *Gymnadenia conopsea*, lesser twayblade *Listera cordata*, common twayblade *L. ovata*, frog orchid *Coeloglossum viride*, early marsh orchid *Dactylorhiza incarnata* and northern marsh orchid *D. purpurella*. Some of these orchids are regionally rare. Globeflower *Trollius europaeus* is widespread on the south of Tir Stent and adder's-tongue *Ophioglossum vulgatum* is common on some of the bracken fringes.

Intermixed with the mires, heaths and acidic grassland are numerous springs and flushes, which form a network across the site. The species to be found depend on how much water the area is receiving and how acid or base rich it is. Bottle sedge *Carex rostrata* beds with the mosses *Sphagnum recurvum*, *S. cuspidatum* and *Polytrichum commune* occur at the more acidic end of the spectrum. There are also flushes with star sedge, common sedge, soft rush *Juncus effusus*, or sharp-flowered rush, the moss *S. palustre*, velvet bent *Agrostis canina*, tormentil and purple moor-grass.

In some of the gullies at higher altitudes, for example on Craig Cwmrhwyddfor, a mixture of liverworts *Anthelia julacea*, *Marsupella emarginata* and *Scapania undulata* are found with tufted hair grass *Deschampsia cespitosa*. Also at higher altitudes around the heads of springs the moss *Philonotis fontana* with starry saxifrage is found. More base-rich springs are also found on Cadair Idris with the mosses *Cratoneuron commutatum* and *Bryum pseudotriquetrum*.

On Tir Stent a small area of mire dominated by bottle sedge and sharp-flowered rush typical of Scotland and the north of England is found. This mire has abundant, more base-demanding Sphagnum mosses, *S. warnstorfii*, *S. teres* and *S. contortum*. Within the same common there are some small pools and soakaways with frequent marsh St John's-wort *Hypericum elodes* and bog pondweed *Potamogeton polygonifolius*.

On the very wet shallow peat, flushes of carnation sedge, jointed rush *J. articulatus*, rosettes of the common butterwort *Pinguicula vulgaris* with the brown mosses *Campylium stellatum*, and *Drepanocladus revolvens* are found, with the lesser clubmoss and bog pimpernel *Anagallis tenella*.

On the northern and eastern fringes of Cadair Idris there are scattered woodlands with gullies and ravines. These woodlands, stream gullies and the mixture of base and acidic rocks together with the high rainfall and clean air have produced ideal conditions for a diversity of lower plants and ferns to thrive. The ferns of the area are a very important part of the flora, with many species recorded, and found in abundance within the site. Tunbridge filmy-fern *Hymenophyllum tunbrigense*, occurs at one of the best sites in North Wales, by Nant Cadair.

Oak *Quercus sp*. dominated woodland with abundant downy birch *Betula pubescens*, rowan *Sorbus aucuparia*, holly *Ilex aquifolium*, frequent patches of hazel *Corylus avellana* and hawthorn *Crataegus monogyna* make up the majority of the woodland within the site. The commoner bryophytes including *Isothecium myosuroides*, *Polytrichum formosum*, *Pleurozium*

schreberi, Mnium hornum, Thuidium tamarascinum, Plagiothecium undulatum, Dicranum majus and *D. scoparium* are abundant within these woods.

Mosses and liverworts form a luxuriant covering under the tree canopies, on the sides of stream gullies and crags. In addition to the commoner species a number of nationally scarce species have been recorded here. These include the liverworts *Radula voluta, Jamesoniella autumnalis, Calepogeia azurea* and *Tritomaria exsecta* and the mosses slender green feather moss *Hamatocaulis vernicosus, Bartramia halleriana,* silky swan-neck moss *Campylopus setifolius, Ditrichum lineare, Hedwigia integrifolia, Racomitrium elongatum, R. affine, R. sudeticum, Rhabdoweisia crenulata, Sphagnum angustifolium, S. flexuosum, S. platyphyllum, S. subsecundum* and *Leptodontium recurvifolium*. In addition there are many Atlantic liverworts and mosses and Western liverworts and mosses, recorded within the site. These communities make up a very rich and diverse bryophyte flora, which is one of the best in North Wales.

The lichen flora is also outstanding with 26 nationally scarce lichens recorded, including specialists of oceanic woodland such as *Micarea stipitata, Pannaria mediterranea, Parmelia endochlora, Parmelia horrescens* and *P. testacea*.

Small areas of oak woodland but with no shrub layer and a relatively sparse bryophyte cover occur on the lower slopes of Coed Cedris and a small area at Graig Ddu. The field layer is characteristically grassy with frequent bluebell *Hyacinthoides non-scriptus*, tormentil and heath bedstraw.

Within the larger blocks of oak woodland on the northern slopes there are smaller stands of alder *Alnus glutinosa*-dominated woodland. These stands occur on the wetter more moderately lime-rich soils and have a grassy field layer with frequent remote sedge *Carex remota*, soft-rush, common marsh-bedstraw *Galium palustre* and meadowsweet.

Ash *Fraxinus excelsior* woodland with oak and hazel occurs in the Dôl-y-cae area. Scaly male-fern *Dryopteris affinis* and broad buckler fern can be found with herb-robert *Geranium robertianum*, enchanter's-nightshade *Circaea lutetiana*, wavy bitter-cress *Cardamine flexuosa* and yellow pimpernel *Lysimachia nemorum*. There are also scattered small stands of birch-dominated woodland with purple moor-grass and Sphagna bog mosses.

On the lower slopes of Mynydd Moel and above Llyn Cau are very small areas of herb-rich grasslands. Species such as wild thyme, common dog-violet *Viola riviniana,* sheep's fescue, common bent *Agrostis capillaris,* tormentil, harebells, and the moss *Hylocomium splendens* can be found here. Also occurring with these species is the yellow-sedge *Carex viridula ssp. oedocarpa*, and the mosses *Racomitrium ericoides* and *Sphagnum denticulatum*.

There are extensive areas of acid grassland, which sometimes form mosaics with the heath, woodland, mires and blanket bogs. The scattered mature hawthorns on the lower slopes are indicative of a historical relaxation in grazing pressure. There are also areas, sometimes extensive of rush-pasture, marshy-grassland and scrub. Tal-y-llyn forms a large lake in the middle of the site and there are networks of streams and rivers throughout. At one recorded point the Nant Cadair becomes slow moving and a thin bed of water horsetails *Equisetum fluviatile* has formed. The upper reaches have rock, scree and boulder fields. There is also neutral grassland within the site.

An important outlying population of the nationally scarce marsh fritillary butterfly occurs on Cadair Idris at Tir Stent, where the butterfly's food plant devil's bit scabious can be found in abundance. The larval stage of the nationally rare Welsh clearwing moth can be found at Tir Stent in a few of the mature birch trees. There is an assemblage of nationally rare or scarce montane invertebrates which have been recorded on Cadair Idris including the rove beetles *Anthophagus alpinus, Geodromicus longipes* and *Oxypoda tirolensis*; the beetles *Aphodius lapponum* and *Byrrhus arietinus*; the ground beetles *Carabus glabratus, Leistus montanus*, and *Pterostichus aethiops*; the spiders *Lephthyphantes whymperi* and *Micaria alpina*; a wolf spider *Pardosa trailii*, a fly *Phaonia consobrina*, and Ashworth's rustic moth *Xestia ashworthii*.

A population of the lesser horseshoe bat uses the mines on Cadair Idris for hibernation. The mines are all in relatively close proximity to each other and to the maternity roosts of Bryn y Gwyn Isaf SSSI and Penmaenuchaf Hall SSSI. The hibernacula at Pandy mine supports approximately 100 lesser horseshoe bats and although the other mines may support smaller numbers they all form an intricate part of the larger bat population in this area. The frequent woods and trees around the site provide them with areas over which to forage and are important links between the maternity roosts and hibernacula. The abundance of hazel in the woods provides good habitat for a population of the common dormouse *Muscardinus avellanarius* to breed and forage.

The European otter *Lutra lutra*, brown hare *Lepus europaeus* and the water vole *Arvicola terrestris* regularly use the site. Lampreys, river *Lampetra fluviatilis* and/or brook *L.planeri*, have been recorded from a river within the site. The rivers both upstream and downstream of Tal-y-Llyn lake are spawning grounds for Alantic salmon *Salmo salar*.

Birds which breed within the site include peregrine *Falco peregrinus*, raven *Corvus corax*, ring ouzel *Turdus torquatus* and skylark *Alauda arvensis*. The woodland and ffridd support typical species including wood warbler *Phylloscopus sibilatrix*, pied flycatcher *Ficedula hypoleuca*, spotted flycatcher *Muscicapa striata*, redstart *Phoenicurus phoenicurus*, tree pipit *Anthus trivialis* and song thrush *Turdus philomelos*.

Remarks:

Part of the site forms Cadair Idris candidate Special Area of Conservation, and part is in Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionydd Oakwoods and Bat Sites candidate Special Area of Conservation under the EC Habitats Directive (Directive 92/43/EEC on the conservation of Natural Habitats and of Wild Fauna and Flora).

Part of the site is a National Nature Reserve.

The site lies wholly within Snowdonia National Park.

Slender green feather-moss is listed under Schedule 8 of the Wildlife and Countryside Act 1981, as amended.