

## *The Axmouth to Lyme Regis Undercliffs*

In 1955, the Axmouth to Lyme Regis Undercliffs were declared a National Nature Reserve (NNR) covering an area just under 305 ha in a narrow coastal strip of about 8 km in length. All of the Reserve lies within a Site of Special Scientific Interest (SSSI) extending a little further east than the NNR, including more of Ware Cliffs beyond Devonshire Head. The site is also part of the East Devon Area of Outstanding Natural Beauty and is recognised internationally both as part of the Sidmouth to West Bay Special Area of Conservation and of the Dorset and East Devon Coast World Heritage Site.

The Reserve is the largest coastal landslip area in Europe. The coast is unstable because permeable Cretaceous strata, chalk and greensand, overlay impermeable Jurassic and Triassic clays and mudstones. Water accumulating at the junction acts as a lubricant and allows the Cretaceous rocks to slip seaward as the sea gradually erodes the foot of the cliffs. Small slips occur more-or-less continuously, large ones at intervals of a century or so. This instability makes the site remarkably inaccessible; the coast path is the only access open to the public and although there are a number of other access points and tracks used for management, they are often unsafe and not in general use. Access away from the Coast Path is hazardous because of hidden fissures and ivy-covered holes and cliffs.

### **History**

The history of the site is not well known. Worked flints are common in the fields above, and one may assume that the flint tool users moved through the Undercliffs to access the beach, and probably sourced food plants and animals from within it. What we do know, for certain, is that in the 16<sup>th</sup>–17<sup>th</sup> Centuries the area was much



The 'Chasm' which separates Goat Island from the 'mainland'.

## Areas of outstanding botanical interest

more open and less wooded than it is now. There was extensive sheep grazing, and the remains of at least one sheep wash can still be seen. At this time, also, there were several occupied cottages in the Undercliffs (Campbell 2006).

The best-recorded major slip was at Christmas 1839 when a large block towards the western end became detached from the 'mainland' by a combination of seaward slippage and foundering of a strip of land. This left two features that persist today. The detached portion, known as Goat Island, is now partly grassland; in 1839 it carried arable crops which were ceremonially harvested in 1840. Seeds of arable weeds from this time probably still survive in the soil; a plant of Weasel's-snout *Misopates orontium* appeared in 2008 after vigorous clearance of scrub. The line of hedgebanks are still discernible, often marked by some fine veteran Field Maple *Acer campestre*. Goat Island is separated from the main cliff by 'The Chasm' where dense Ash *Fraxinus excelsior* woodland has developed entirely naturally.

## Vegetation

Scientific interest in the area, known widely in the 1950s as 'The Landslip', was confined initially to its geological, geomorphological and palaeontological importance. Its biological interest began to be appreciated in the 1950s and 1960s chiefly through the pioneering work of Tom Wallace when he was biology master at Allhallows School in Rousdon (Wallace 1976). His extensive records have laid the basis for a site dossier (Campbell 2002).

Because of continual landslipping and succession, types of vegetation are often transient. Among the mosaic of habitats present within the Reserve, woodland is the most extensive; other plant assemblages are scrub, grassland, fresh water and flushes, bare ground and cliffs, and the sea shore.

The sea shore, which is largely shingle, is littered with blocks, boulders and other debris of the landslips. Maritime vascular plants are Sea-kale *Crambe maritima* which in Charton Bay forms large, flourishing clumps, often with Rock Samphire *Crithmum maritimum*, Sea Beet *Beta vulgaris* subsp. *maritima* and Spear-leaved Orache *Atriplex prostrata*. At the top of the beach, particularly where there is seepage of fresh water, Perennial Sow-thistle *Sonchus arvensis* may be found.

The cliffs vary a great deal. Sheer faces, whether of Triassic mudstones, chalk or greensand tend to be largely free of vegetation; a notable exception was the record of Henbane *Hyoscyamus niger* on unstable greensand on Haven Cliff in 1997. Where slopes are more broken and less sheer, there may be abundant Colt's-foot *Tussilago farfara* followed later in the season by Common Bird's-foot-trefoil *Lotus corniculatus* and Kidney Vetch *Anthyllis vulneraria*. In places a varied calcicole flora is invaded by Butterfly-bush *Buddleia davidii* and, occasionally, by Pampas Grass *Cortaderia selleana*. Nearer the shore, Great Mullein *Verbascum thapsus* and Wild Teasel *Dipsacus fullonum* are common, among occasional plants of Portland Spurge *Euphorbia portlandica* and Yellow Horned-poppo *Glaucium flavum*. Soft cliffs, noted for their important invertebrate species, often support Blue Fleabane *Erigeron acris*.

Seepages and ledges in the greyish Triassic Tea-green Marls sometimes support Brookweed *Samolus valerandi*, Bog Pimpernel *Anagallis tenella*, Yellow-wort *Blackstonia perfoliata* and the scarce Slender Club-rush *Isolepis cernua*, recorded for the first time at Culverhole in 2009. Also at Culverhole, an intriguing combination of tall marsh herbs is found: here are Reed *Phragmites australis*, Wood Small-reed *Calamagrostis epigejos*, Black Bog-rush *Schoenus nigricans*, Great Horsetail *Equisetum telmateia*, Southern Marsh-orchid *Dactylorhiza praetermissa*, Marsh Helleborine *Epipactis palustris* and the rare Marsh Fragrant-orchid *Gymnadenia densiflora*, known only from two other sites in Devon.

In a few places, drainage water is impeded to form pools and ponds; 'Humble Pond' is an example. Hemp Agrimony *Eupatorium cannabinum*, Common Fleabane *Pulicaria dysenterica*, Purple-loosestrife *Lythrum salicaria* and Great Willowherb *Epilobium hirsutum* are typical species surrounding pools, which in summer are often covered with Common Duckweed *Lemna minor* and Least Duckweed *L. minuta*. Blue Water-speedwell *Veronica*



Looking east along the 'Plateau'.

*anagallis-aquatica*, Bulrush *Typha latifolia* and Grey Club-rush *Schoenoplectus tabernaemontani* are also recorded from 'Humble Pond'.

In 1955, some 25% of the Reserve was open grassland but the lack of grazing and the virtual elimination of the Rabbit *Oryctolagus cuniculus* population by Myxomatosis have together led to the succession of most of the grassland to scrub and to woodland. The grasslands that remain are now maintained artificially by annual mowing and raking; no feasible means of grazing has yet been found for such inaccessible sites, although Rabbits have returned and Roe Deer *Capreolus capreolus* are common. Species-rich chalk grassland is best represented on Goat Island and the 'Plateau' where in excess of 30 species/m<sup>2</sup> are usually found. The unusual management of these grassland sites makes for unusual vegetation: although Fescues *Festuca* spp., Downy Oat-grass *Avenula pubescens*, Meadow Oat-grass *A. pratensis* and Yellow Oat-grass *Trisetum flavescens* are present, species typical of grazed grassland are absent; the frequent presence of False-brome *Brachypodium sylvaticum* and the occurrence of many woody seedlings tends to suggest that the grassland would rapidly revert to scrub without management by cutting and strimming. Nevertheless, many 'classic' chalk grassland herbs are found, including Hairy Violet *Viola hirta*, Squinancywort *Asperula cynanchica*, Small Scabious *Scabiosa columbaria*, Common Rock-rose *Helianthemum nummularium*, Hawkweed Ox-tongue *Picris hieracioides*, Hoary Ragwort *Senecio erucifolius*, Ploughman's-spikenard *Inula conyzae*, Viper's-bugloss *Echium vulgare*, Carline Thistle *Carlina vulgaris* and Dwarf Thistle *Cirsium acaule*. Glaucous Sedge *Carex flacca*, Confused Eyebright *Euphrasia confusa*, Marjoram *Origanum vulgare*, Salad Burnet *Poterium sanguisorba* and Lotus *corniculatus* are common. Harebell *Campanula rotundifolia*, which inexplicably is a very rare plant in Southwest England (Preston *et al.* 2002), occurs only on the 'Plateau' which is also the stronghold of the rare annual/biennial endemic Early Gentian *Gentianella anglica*, the abundance of which varies greatly from year to year; 19 plants were counted in 2006 on shallow soil at the cliff edge where the scarce Soft-brome *Bromus hordeaceus* subsp. *ferronii* also occurs.

## Areas of outstanding botanical interest

The Autumn Gentian *Gentianella amarella* can be especially abundant on Goat Island where in some seasons there are at least 30,000 plants. Nine Orchid taxa are found in the grassland on Goat Island, including Bee Orchid *Ophrys apifera*, Pyramidal Orchid *Anacamptis pyramidalis*, Greater Butterfly-orchid *Platanthera chlorantha* and Autumn Lady's-tresses *Spiranthes spiralis*, of which sometimes there are more than 100 plants. Rather surprisingly, both *Epipactis palustris* and *Dactylorhiza praetermissa*, with its variety *junialis* (Leopard Marsh-orchid), also occur here in open dry chalk grassland.

New areas of grassland are being created by scrub clearance, most notably in 'Humble Hollows' and on Humble Point below Whitlands, and in the 'Elephant's Graveyard' below Haven Cliff. Progress in restoration of chalk grassland after clearance of Evergreen Oak *Quercus ilex* near Humble Point is slow though seed of at least some typical grassland calcicoles do seem to persist in the soil (Allen 2009). Most significant among species here is the appearance of the scarce Pale St John's-wort *Hypericum montanum*. Improved access into the 'Elephant's Graveyard' has revealed a population of Nottingham Catchfly *Silene nutans*.

Close to the sea, the cliff slopes are covered by a dense wind-pruned scrub, often less than 2 m high. This is composed of Hawthorn *Crataegus monogyna*, Blackthorn *Prunus spinosa*, Wayfaring-tree *Viburnum lantana*, Wild Privet *Ligustrum vulgare* and Spindle *Euonymus europaeus*. The dense mass of low shrubs is further bound together by Wild Madder *Rubia peregrina* and by Narrow-leaved Everlasting-pea *Lathyrus sylvestris*. There are also extensive areas of Hazel *Corylus avellana*, usually further from the sea and on more level ground. Associated with *L. vulgare* in scrub, Purple Gromwell *Lithospermum purpureocaeruleum* is recorded from the Reserve (English Nature 1986b) but it has not been seen here for many years. Scrub clearance in the 'Elephant's Graveyard', beneath the 'Finger and Thumb' on Haven Cliff, revealed the presence of Broad-leaved Helleborine *Epipactis helleborine* for the first time in 2011.

Much of the Reserve is now covered by moderately dense woodland, usually dominated by *Ash*, particularly toward the western end. Other trees include Pedunculate Oak *Quercus robur*, Field Maple *Acer campestre* and, in a few places, Small-leaved Lime *Tilia cordata*. The understorey is made up of Hazel, Spindle and Hawthorn. Ivy forms a carpet over a high proportion of the ground in the Undercliff woodlands, often accompanied, particularly along paths, by its parasite Ivy Broomrape *Orobanche hederæ*. Ivy also ascends into the tree crowns and hangs down in wefts, and Traveller's-joy *Clematis vitalba* is often common, sometimes huge, with its stems hanging in loops from the taller trees giving a decidedly tropical liana-draped appearance to the woodland. The ground layer is usually rather sparse, but many of the common spring-flowering herbs occur, including Bluebell *Hyacinthoides non-scripta*, Lesser Celandine *Ficaria verna*, Primrose *Primula vulgaris*, Common Dog-violet *Viola riviniana*, Wood Spurge *Euphorbia amygdaloides*, Dog's Mercury *Mercurialis perennis*, Bugle *Ajuga reptans* and, rarely, Daffodil *Narcissus pseudonarcissus*. Throughout the Reserve, the most prominent components of the ground flora include Pendulous Sedge *Carex pendula*, Lords-and-Ladies *Arum maculatum*, Stinking Iris *Iris foetidissima* and Hart's-tongue Fern *Asplenium scolopendrium*, often with Soft Shield-fern *Polystichum setiferum*. Occasionally, where more acid rocks form the base, Hard Fern *Blechnum spicant* occurs. Such acid sites also have abundant Birch *Betula pendula* as well as Bracken *Pteridium aquilinum*. The relative poverty of the ground flora may be due to the relative youth of these woodlands; as mentioned earlier, it is known that the woodlands have spread greatly in the last 200 years, some from hedge lines. Woodland 'specialities' of the Reserve include the calcicole Spurge-laurel *Daphne laureola* and Yellow Bird's-nest *Hypopitys monotropa* subsp. *hypophegea* which is known from only one other site in the county. Interestingly, *H. monotropa* is now known to be parasitic on species of the fungus *Tricholoma* (Spooner and Roberts 2005), so that a survey of this genus of toadstools near where *H. monotropa* is known could prove valuable. A persistent but not unwelcome garden escape is Pyrenean Lily *Lilium pyrenaicum* which was last seen on 'The Avenue' in 1997.

The large gardens of the big houses at Rousdon and Pinhay have been responsible for the introduction of numerous species to the Undercliff woodlands. *Quercus ilex* is now widespread and a growing problem because its acorns are distributed by Woodpigeons *Columba palumbus* and Jays *Garrulus glandarius*. Where it forms dense stands, it eliminates virtually all the ground flora, even ivy. Much effort is expended in clearing it; the aim is to keep the western end of the site clear of it, and to check it and if possible gradually drive it back in the eastern part, particularly where it threatens calcareous grassland such as in the glades of 'Humble



Common Spotted-orchids *Dactylorhiza fuchsii* on Goat Island.

Hollows'. Sycamore *Acer pseudoplatanus* is also widely distributed and a similar policy applies to this. Turkey Oak *Quercus cerris* is also widespread. Cherry Laurel *Prunus laurocerasus* forms dense patches, usually close to where it has been planted, and is cleared whenever possible. Luckily most of the site is too alkaline for Rhododendron *Rhododendron ponticum*, but occasional plants can be found. Other species such as Beech *Fagus sylvatica*, Lime *Tilia × europaea* and Norway Spruce *Picea abies* have been planted but do not seem to spread. There are isolated trees of numerous garden species, particularly in the Pinhay area, but, again, these do not appear to be spreading.

### The future: surveys and management

Monitoring rare species across the Reserve is a huge challenge because of the remote and inaccessible nature of much of the terrain and the constantly changing habitats as a result of earth movements. Many of the rarer species have only a few records, and some species have not been recorded for some years (Sunderland, 2010). Nevertheless, there are a number of nationally scarce species and at least 27 'County Rarities' (Margetts 2007b) extant on the Undercliffs. A 'Bioblitz' in 2011 may well have added new records. There are no recent records of *Lithospermum purpureocaeruleum*, a Red Data Book rarity, nor has Tall Sea-lavender *Limonium procerum* been seen in recent years. Similarly, the nationally declining Green-winged Orchid *Anacamptis morio* seems locally extinct.

Sometimes earlier records refer to species found just outside the perimeter of the NNR. Examples include: Bird's-nest Orchid *Neottia nidus-avis*, which persists on the cliff-top near Rousdon; Horseshoe Vetch *Hippocrepis comosa* on Bindon Cliff and in Lynch Cottage Meadow; and Bithynian Vetch *Vicia bithynica* on Ware Cliffs, presumably inside the SSSI if not the NNR. As habitats suited to these and other uncommon species are improved through management, there is no clear reason why they should not be found within the Reserve.

## Areas of outstanding botanical interest

Much of the woodland belongs to the *Fraxinus excelsior-Acer campestre-Mercurialis perennis* Ash-Field Maple-Dog's Mercury (W8) woodland community in the National Vegetation Classification (NVC) (Rodwell 1991, 1992) and some of the areas of scrub fit the *Viburnum lantana* Wayfaring Tree sub-community of *Crataegus monogyna-Hedera helix* Hawthorn-Ivy scrub (W21d). Areas of grassland on Goat Island and the 'Plateau' have been found to have affinity to each of the following NVC communities: *Koeleria macrantha* Crested Hair-grass sub-community of *Festuca ovina-Carlina vulgaris* Sheep's Fescue-Carlina Thistle grassland (CGle); *Cirsium acaule-Asperula cynanchica* Dwarf Thistle-Squinancywort sub-community of *Festuca ovina-Avenula pratensis* Sheep's Fescue-Meadow Oat grassland (CG2a); *Dactylis glomerata-Briza media* Cock's-foot-Quaking Grass sub-community of *Avenula pubescens* Downy Oat grassland (CG6a) and *Festuca ovina-Pilosella officinarum-Thymus polytrichus* Sheep's Fescue-Mouse-ear Hawkweed-Wild Thyme grassland (CG7). Vegetation that does not readily fit within current NVC classification is termed False-brome grassland (Cox *et al.* 2012). Over the 18 years of NVC survey, it has become clear that the cutting management rather than grazing by livestock has had significant effects on the composition of the grassland.

The Undercliff, wilderness though it is, requires management to maintain its vegetational diversity. The grasslands will continue to need annual cutting to prevent scrub encroachment. Clearance of alien trees, particularly *Quercus ilex*, will have to continue. Unfortunately the extremely rugged terrain makes it impossible to extract more than tiny quantities of the valuable firewood that *Q. ilex* timber represents. *Buddleia davidii* is a widespread problem wherever there is open ground, either after clearance of other species or on unstable cliffs; its very small and extremely abundant seed makes it very difficult to control, and it may, in the long term, prove to be the most intractable of the introduced species.

There will undoubtedly be major landslips in the future; let us hope that botanists and ecologists will be there to record the subsequent development of the sites. We can surmise how the woodland in 'The Chasm' has developed since 1840, but more precise data on both vegetation and soils would be welcome.

**David J. Allen and Mike Lock**