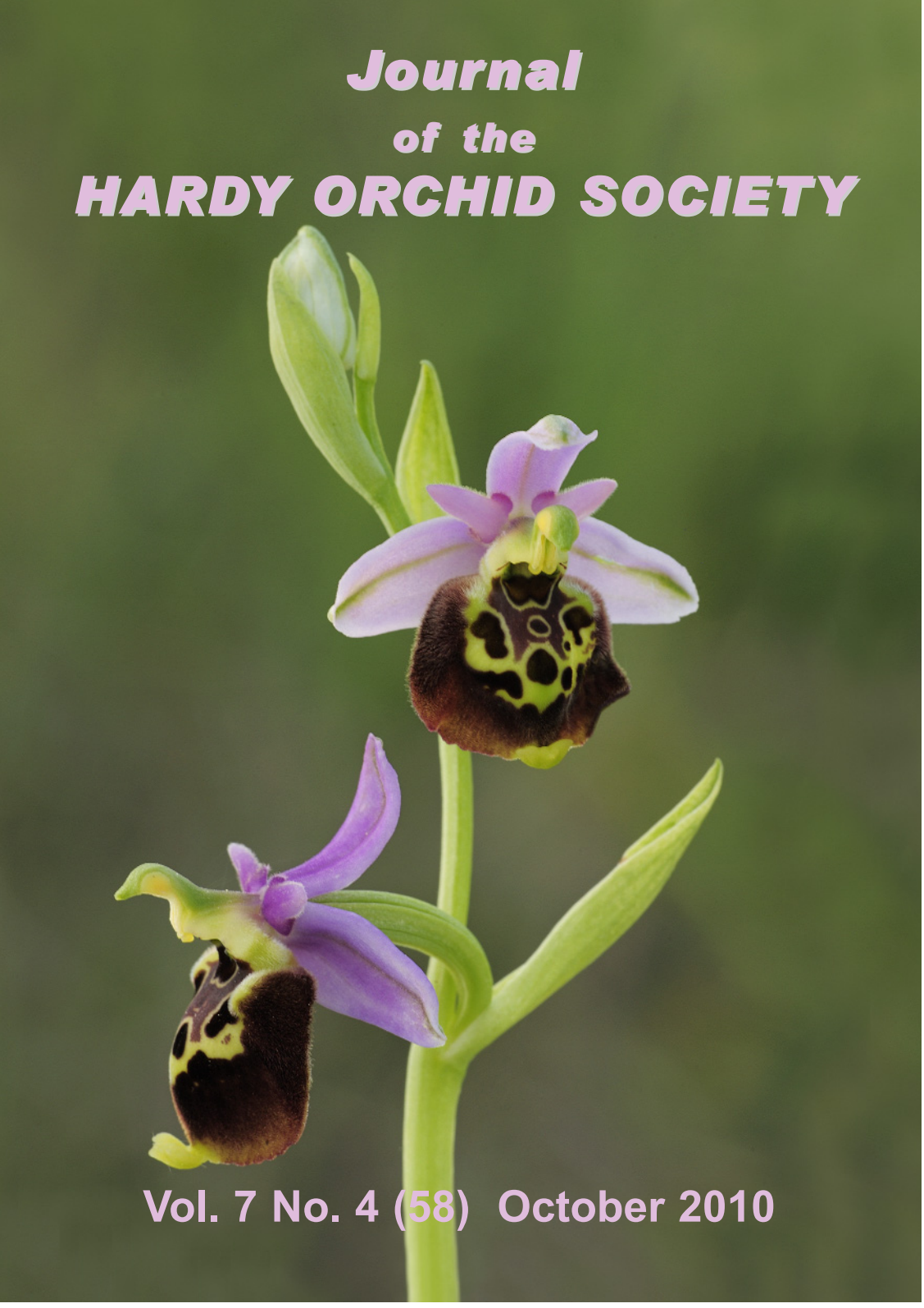
Journal of the HARDY ORCHID SOCIETY



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The Hardy Orchid Society

Our aim is to promote interest in the study of Native European Orchids and those from similar temperate climates throughout the world. We cover such varied aspects as field study, cultivation and propagation, photography, taxonomy and systematics, and practical conservation. We welcome articles relating to any of these subjects, which will be considered for publication by the editorial committee. Please send your submissions to the Editor, and please structure your text according to the "Advice to Authors" (see website **www.hardyorchidsociety.org.uk**, January 2004 Journal, Members' Handbook or contact the Editor). Views expressed in journal articles are those of their author(s) and may not reflect those of HOS.

The Hardy Orchid Society Committee

Front Cover Photograph
Ophrys tetraloniae in Croatia (see article on page 134)
Photo by Robert Thompson

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Editorial Note

I am sure that many will have noticed that the photographic print quality has been somewhat variable in the last two journals and was especially poor for much of the July *JHOS*. Together with our printer, Keely Print, we have been working to solve this problem and hope to have achieved a better overall quality this time and in particular to do justice to the excellent professional photography contributed once again by Robert Thompson.

This *JHOS* carries a detailed article from our President that was prompted by an exchange of messages on the discussion forum, again emphasizing how successful that initiative has been. Richard explains in detail the various issues involved in conserving small, vulnerable remnants of some of our rarest orchids and presents his own views on what can sometimes be a controversial topic.

As will be clear from Richard Bateman's article there are serious challenges in addressing the genetic constitution of remaining individuals when orchid populations are reduced to very small numbers as has happened to both *Orchis simia* and

Cypripedium calceolus. For the latter species there is an especially important site that retains the remaining definitively British plant of the Lady's Slipper Orchid and the genetic makeup of the recovered population here has been the subject of some discussion within the society. It is worth clarifying that all plants that are present on this "Wild Site" are exclusively British. In securing the recovery of the Lady's Slipper Orchid some other plants have been included in the Kew programme to produce *in vitro* generated plants for re-introduction into the environment but none of these are present at this primary "Wild Site". It is encouraging to see the general success of the *Cypripedium calceolus* recovery programme and this is nicely illustrated by the HOS field trip to Gait Barrows that is also reported in this *JHOS*.

Chairman's Report

Celia Wright

This year has been a trying one for the organisation of HOS meetings. The RHS is changing the arrangements it makes with its affiliated organisations for the use of RHS premises for meetings. Because we do not know what conditions will be put on the use of Wisley in the future, the committee has decided to hold the southern autumn meeting at Capel Manor College, Enfield, EN1 4RQ in late October 2011. The College is set in attractive gardens and is easily reached from the M25. On September 12th we held our Harlow Carr meeting in their new Education Building. The room and facilities now available are not suitable for HOS meetings, so next year we will use an alternative northern venue for our mid September meeting. I hope to let you all know the details in the next Journal.

From time to time there have been requests from Scottish members for a future HOS meeting to be held in Scotland. In the past, a field trip was organised north of the border, but was not well attended. Should HOS try for a meeting north of the border, possibly at a Botanic Garden and maybe with a field trip attached? For this to be possible, we would need a meeting organiser who lives in Scotland. If any member would like to do this, please get in touch with me. This would be in addition to our Northern meeting.

Our first seed sowing workshop in July this year was a considerable success with excellent feedback from the members who attended. My thanks go to Phil Seaton who originally put the idea forward and to John Haggar, whose practical experience and enthusiastic presentation made the whole day very informative and enjoyable. We hope to run another workshop in 2011, adjusting the day's programme to reflect attendees' feedback. This is likely to be in July/August as this is the best time of year for sowing most hardy orchid seed. Anyone interested should forward their contact details to our Secretary, Alan Leck, who will contact all those on the list as soon as a date has been arranged.

Report on 2010 Field Trips

David Hughes

The orchid season in England started under a cloud. The cloud was of course volcanic ash which threatened to prevent the leader of the annual pilgrimage to the "Early Spiders" of Purbeck returning from the equally exotic *Ophrys* of Greece. However, an epic drive from Venice in a Fiat Panda saved the day although many of the booked participants had been discouraged. Those who came though were rewarded on the 25th April with a fine spread of *Ophrys sphegodes* for several miles along the downs above the sea cliffs and the first of the Green Winged Orchids, *Anacamptis morio*. The Purbeck puffins were also in evidence.

Mike Parsons was kind enough to take two trips this year. The first on 3rd May was a return to Samphire Hoe to admire the tens of thousands of Early Spider Orchids which are well established on this artificial chalk spit near Dover. Then, on 30th May, another site near Folkestone provided the Late Spider Orchid, *Ophrys holoserica*.

Brian Laney reported a good turn out of members and friends on 23rd May at Oversley Wood, the only Warwickshire site for the Sword Leaved Helleborine, where it was in perfect condition on both sides of the track. At nearby Snitterfield Bushes, there were two sites for Bird's Nest Orchid, *Neottia nidus-avis*. One specimen was found under a hazel bush but at the other site, partly due to tree clearance and also the dry conditions, the one specimen had withered. This was despite Brian having watered the plant to try to keep it going for the day. Finally, at Ufton Fields three Man Orchids, *Orchis anthropophora*, were found, three other spikes having been destroyed by late frost.

On the same day Ann and Ken Kitchen guided 16 members around Silverdale, the fascinating limestone scar of northern Lancashire. Lady's Slipper Orchid, *Cypripedium calceolus*, was the star of the day. First was the long established plant at Silverdale itself, which wasn't quite in flower. Moving to Gait Barrows National Nature Reserve, the group were treated to a fine display of Lady's Slipper Orchids in flower. These plants have been raised by Kew and re- established in the wild so successfully that it is now considered safe to allow public access. The day also included *Orchis mascula*, *Anacamptis morio*, *Ophrys insectifera, Platanthera chlorantha* and *Neottia ovata*, together with a visit to the Cypripediums in Ken and Ann's garden.

Hardy Orchid Society members enjoying the Silverdale field trip (top) and one of the fine flowering plants of Lady's Slipper Orchid, *Cypripedium calceolus,* at Gait Burrows National Nature Reserve (bottom)
Photos by Ken & Ann Kitchen

June 20th was marked by three field trips. The trip organised by Jean Stowe in Peterborough covered the whole weekend and entertained 20 people. Langdyke's Swaddywell Pit bucked the trend for poor Bee Orchids by presenting plentiful *Ophrys apifera*. *Dactylorhiza fuchsii* and its hybrids were the subject of much debate as were *Dactylorhiza incarnata* and its hybrids at Caster Hanglands. Jean points out that despite the visitor numbers, trampling was avoided by splitting the party into two groups and having four leaders. Meanwhile, Alan Blackman was leading a group to the Lizard Orchids, *Himantoglossum hircinum*, in Kent and Nigel Johnson and Rosie Webb took members to see the massed Musk Orchids, *Herminium monorchis,* at Noar Hill in Hampshire. It is worth mentioning here that Nigel's trip was under-subscribed as it had not been announced in the Journal. However, it was listed on the HOS website, so keep a watch on the website for late notices!

Tyne Helleborine, *Epipactis dunensis* var. *tynensis* at Hexham
Photo by Colin Scrutton

A month later on July 18th and much further north, Colin and Angela Scrutton led a trip in Northumberland. Starting at Hexham they found 200 spikes of Tyne Helleborine, *Epipactis dunensis* var. *tynensis*, and took the opportunity to compare it with the closely related Dune Helleborine of Lancashire. A long drive to Holy Island was rewarded with plenty of spikes of Lindisfarne Helleborine, *Epipactis sancta*. Marsh Helleborine, *Epipactis palustris*, was also abundant and a few Northern Marsh Orchids, *Dactylorhiza purpurella*, were still in flower. A few visitors were able to find Dark Red Helleborine, *Epipactis atrorubens*, in Durham on their journey home the next day by following the leaders' directions.

Thank goodness for Helleborines which extend our orchid year! On 31st July Mike Clark lured 20 of us to Kenfig, South Wales; surely one of the most exciting natural history locations in the British Isles. We were led around the sand dunes, certainly lost without our guide, and learned that *Epipactis phyllanthes* var. *cambrensis*, Green-flowered Helleborine, has a long, part-folded leaf and grows in the open. *Epipactis helleborine* var. *neerlandica*, Netherlands Helleborine, grows in the open and has leaves from low down on the stem and they are more erect and pointed. The commoner *Epipactis helleborine*, Broad-leaved Helleborine, has flatter more rounded leaves, higher on the stem and suited to its woodland habitat. In addition, *Epipactis palustris*, Marsh Helleborine, was common and we admired the seed capsule of the Fen Orchid, *Liparis loeselii*.

This brings me to the end of a great year of orchid hunting. However, it's not quite over with the Autumn Ladies Tresses, *Spiranthes spiralis*, shooting all over the New Forest and Downs as I write. Watch and communicate on the discussion forum and you can share your orchid hunting experiences. I was delighted to take a group to find the Bog Orchid, *Hammarbya paludosa*, after placing an invitation on the forum. The question of trampling is always a vexed one but I think a good guide can protect the environment. I wish I could say the same for the bullock that was trampling the Bog Orchid location! I am very grateful to the many members of the Society who have led field trips for me and you whilst I have been the co-ordinator. Also, I thank them for their reports and apologise for having to edit them down rather viciously. Malcolm Brownsword is taking over organising the field trips from now. I know you will give him your support and I look forward to being able to go on many more in future seasons.

Dactylorhiza Blight

Isobyl la Croix

I would be interested to hear what experience other members of the HOS have had of "Dactylorhiza blight". We had a large clump of what we thought was a natural hybrid growing in grass, which increased year by year. In the same area, there were other clumps of another *Dactylorhiza* that we had bought as a species (I can't now remember which) but was obviously another hybrid. These too grew well for several years and a good crop of seedlings started to appear. Then three years ago, the natural hybrid and one of the other clumps turned black and collapsed. I sent a specimen to Wisley and got the reply that the plant had a bacterial infection and was also infested with nematodes. I imagine the latter were a secondary infection. The suggested treatment was to spray with a fungicide. The following year the other clump and most of the seedlings also succumbed. What seems strange is that *D. purpurella* and *D. maculata* subsp. *ericetorum* are common round here (northwest Scotland) and seem unaffected. Neither, we thought, was *D. fuchsii* – we brought some plants of that here when we came and it has spread itself around. When I was editing *The Orchid Review*, I started trying to collect information about this with a view to running an article about it, but had not gathered enough by the time the axe fell. In the course of my enquiries, someone suggested that only *D. elata*, *D. foliosa* and their hybrids were affected, which would explain why our local species do not seem to suffer. We had previously grown *D. elata* for a time, so the natural hybrid – a large and vigorous plant – could well have been the result of that crossing with either *D. maculata* or *D. fuchsii*.

Last year I was given three plants of *Dactylorhiza* Bressingham Bonus, which I thought was a selection of *D. fuchsii*. All three flowered this year, but one of them started to produce the dreaded blackening of the leaves and died back. Does this cultivar perhaps have *D. elata* 'blood'? Incidentally, they were in a different part of the

garden from the other affected clumps. Has anyone found a way of treating this blight, or does it mean that we must forget about growing these spectacular plants? How widespread is it – I rarely see it mentioned.

Dactylorhiza hybrid (left) and the effect of "Dactylorhiza blight" (right)
Photos by Eric la Croix

Where Does Orchid Conservation End and Gardening Begin?

Richard Bateman

Background

At the time of writing (July 2010), an energetic series of exchanges has just been posted on the HOS discussion forum in response to the news of a substantial increase in numbers of anthropomorphic *Orchis* plants present at the Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust's (BBOWT) famous Hartslock Reserve, near Goring in Oxfordshire. More specifically, concern was expressed at the numbers of flowering and especially non-flowering plants identified as hybrids between the Monkey Orchid (*Orchis simia*) and the Lady Orchid (*O. purpurea*), hereafter termed the Lonkey Orchid (*O.* ×*angusticruris*: Fig. 1). Total numbers of the hybrid over the period 2006–9 were reported as 23 (7 flowering), 29 (11), 72 (12) and about 130 (27) (cf. Raper 2006–10; Bateman *et al*. 2008; Cole 2010). The corresponding total for 2010 was reported as 300, of which 77 flowered (Bill Temple, pers. comm. 2010; Raper 2006–10). In contrast to the near-exponential increase in the hybrids, numbers of the parental species were fairly stable over this period at about 400 Monkey Orchids and a modest increase from 7 to 23 Lady Orchids.

Figure 1: Lonkey Orchid (*Orchis* ×*angusticruris*), shown in its habitat at the BBOWT Hartslock Reserve, Oxfordshire (left) and in close up (right). Photographed in 2006 by Richard Bateman

Assuming that the Lonkey Orchids show high fertility, as seems likely, these population dynamics clearly suggest a growing probability that the Lonkeys will indulge in considerable gene exchange with one or both parents, potentially converting the larger of Britain's two native populations of Monkey Orchid into a morphologically and genetically blurred introgressed swarm. Not surprisingly, this realisation prompted some spirited exchanges on the HOS discussion forum regarding whether the Lonkey Orchids, and arguably also the more modest number of Lady Orchids, should be expunged from the site in order to preserve the genetic purity of the long-established and nationally rare Monkey Orchids.

Recent research on the Lonkey Orchid yielded rapid but complex fruit

The laudable policy of open access practised at Hartslock meant that my Kew colleagues and I were able to begin morphometric and genetic study of the Lonkey Orchids in 2006, the year of their original discovery (Bateman 2006b; Raper 2006–10; Bateman *et al*. 2008). It was also fortunate that we had already gathered various kinds of data from populations of anthropomorphic *Orchis* species (a group that also includes the Military Orchid, *O. militaris*, and the eastern Mediterranean Punctate Orchid, *O. punctulata*) from across Europe to inform a different, long-term research project. This prior knowledge provided an exceptionally robust framework within which the Hartslock plants could be interpreted.

Fieldwork had already taught us that anthropomorphic *Orchis* species routinely form hybrid swarms elsewhere in Europe (for example, in the Vercors region of France: Figs 2 & 3). Their gradational morphology suggested that the first-formed hybrids were subsequently crossing with each other and back-crossing with both parents. Widespread evidence of gene exchange was found in supposedly pure individuals of every one of these species. Analyses of nuclear (ITS) gene sequences and genome fragmentation data (AFLP) showed that *O. simia* clearly shared genes with *O. punctulata* in the eastern Mediterranean and with *O. militaris* further west, while *O. purpurea* appeared to consist of two distinct genetic groups, one dominantly occurring in the UK and the other dominantly occurring in Continental Europe. Evidently, despite being widely accepted by orchid systematists as full species, these taxa are not strongly reproductively isolated (Fay *et al.* 2007; Bateman *et al.* 2008). Although *O. militaris* appeared morphologically intermediate between *O. simia* and *O. purpurea*, it proved on closer examination to be the most genetically distinct and cohesive of the three species.

Figure 2 (opposite page): Mount of flowers of Lady Orchids (l), Military Orchids (m) and their hybrids (h) from the population shown in Figure 3.
Photos by Richard Bateman

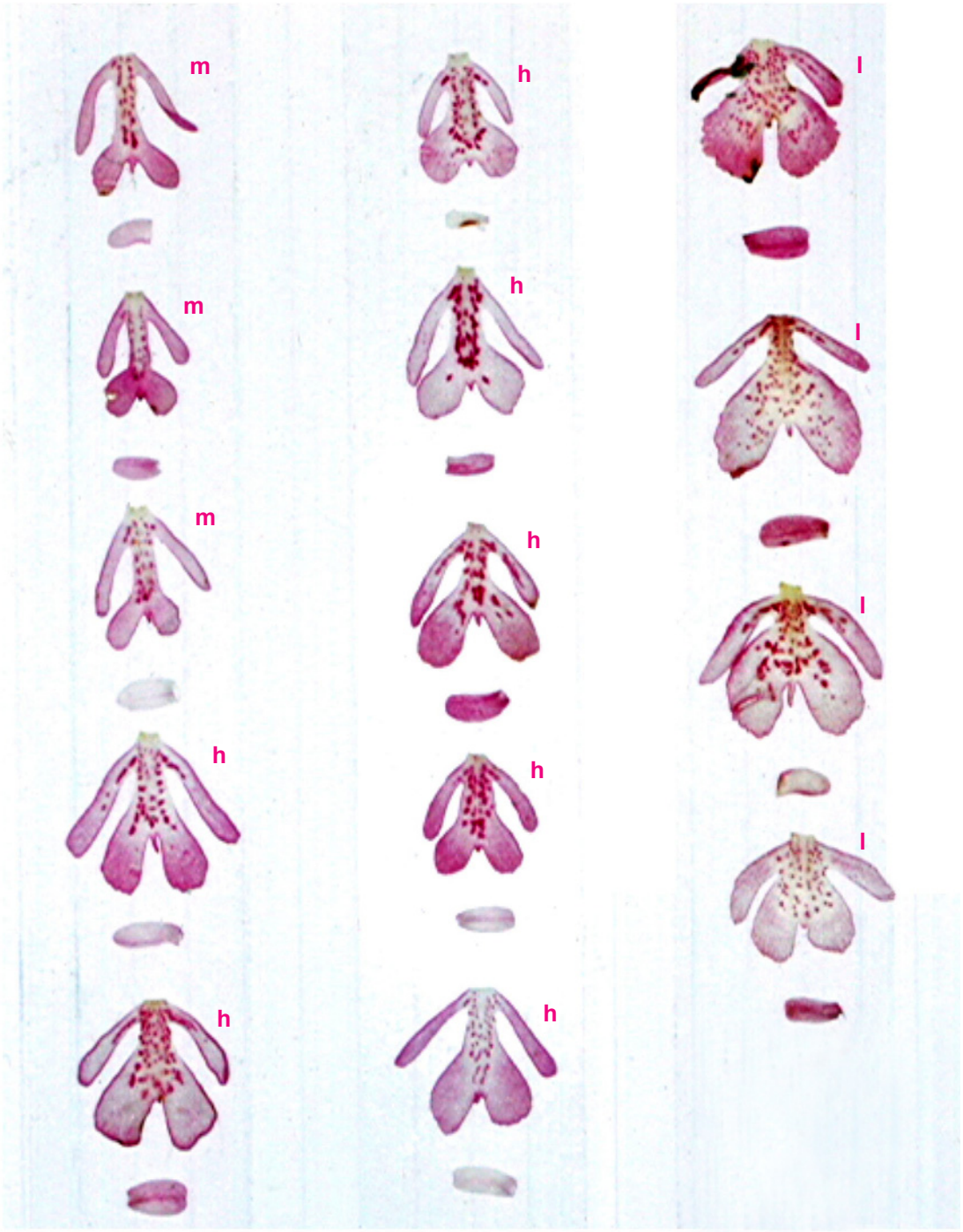
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Figure 3 (above): Hybrid swarm of Lady and Military Orchids in the Vercors, southern France.

Photos by Richard Bateman

Returning to the hybrid Lonkey Orchids at Hartslock, maternally inherited plastid sequences clearly showed that *O. purpurea* was their mother and the later-flowering *O. simia* was their father (Bateman *et al*. 2008). Corresponding morphometric studies suggested that the Lonkey Orchids had inherited approximately twice as much of their outward appearance from their mother as from their father. The genetic data were then used to explore the potential causes of the surprisingly recent arrival of *O. purpurea*, which first flowered at Hartslock only in 1999 (e.g. Raper 2006–10). The one *O. purpurea* population in the vicinity that is widely accepted as native could not have been the source of the Hartslock plants, as it has a typically British complement of genes, whereas those at Hartslock have genes far more typical of Mediterranean populations. This explanation also rules out as a source the more distant UK concentrations of *O. purpurea* in Kent. Assuming that no orchid enthusiast was so foolish as to deliberately plant tubers of *O. purpurea* at Hartslock, these data strongly suggest that the Lady Orchids travelled from the Mediterranean as seeds. This could have occurred either in high-level air currents or through accidental or deliberate introduction by man (Bateman 2006a, b; Bateman *et al*. 2008). Sadly, there is no known scientific test that can distinguish between these competing explanations. Deliberate introduction remains a distinct possibility, with obvious implica-

tions for conservation of the bona fide natives at the site. Should remedial action be taken?

The increasingly interventionist nature of orchid conservation in Britain

For most of the second half of the 20th Century, the most popular form of intervention in orchid populations to be sanctioned by conservation bodies was artificial pollination; humans wielding paint brushes simply substituted for supposedly less reliable insect pollinators. An early example of this strategy was the hand-pollination programme instituted by Hector Wilks in 1958 at the only persistent native population of *Orchis simia* other than Hartslock, located near Faversham in Kent (e.g. Bateman & Farrington 1989); this straightforward intervention apparently boosted the population from 10 to 162 plants in just six years (Harrap & Harrap 2009).

I paid my first visit to the (by then somewhat smaller) native population of *Orchis simia* at Faversham in 1980. From there, I travelled further East through Kent to the Kent Trust reserve at Parkgate Down, where a small cluster of plants derived from seed collected from the Faversham population had been scattered in 1958. Once the first tranche of seedlings had appeared they were protected within an increasingly conspicuous enclosure. As many HOS members will know, that nucleus of plants has since spread across the site to build a population that has become sufficiently large to resist most of the vicissitudes that it is likely to face, either natural or man-induced. In contrast, the population at the original Faversham site has declined in recent years, despite (or perhaps because of?) the construction of an impressively intimidating perimeter fence. As an example of the deliberate introduction of native orchid stock into a novel site, Parkgate Down appears easily defensible on the pragmatic grounds of successful preservation of a severely threatened genetic lineage. On the other hand, it is unlikely that there was a previous, natural population of *Orchis simia* at Parkgate Down, where Monkey Orchids now occur alongside small populations of other uncommon orchids that are assumed to have reached the site without human assistance. Is this site a nature reserve or has it become a botanic garden?

The flagship among the many projects designed to expand our native populations of threatened orchids must surely be that propagating the Lady's Slipper, *Cypripedium calceolus*. I was privileged to visit the last remaining native plant occurring in the wild, at its spectacular West Yorkshire locality, over three years from 1979 (Fig. 4) – before the subsequent conservation-motivated ban on casual visits, but after an efficient permanent summer wardening scheme had been introduced in 1970. Perched rather precariously on its rocky hillside, that lone plant appeared frighteningly vulnerable, even though it represented a population known with certainty to have occupied the site since 1930 (Harrap & Harrap 2009) and probably much earlier. Remarkably, that plant still survives, the clone having spread considerably

across the slope during the last three decades. Nonetheless, there exist few more obvious desperate cases for conservation intervention. Since 1983, a well-funded research programme has applied several different horticultural approaches in an attempt to propagate new individuals that share all, or at worst half, of their genes with that one remaining wild plant in Britain (e.g. Ramsay & Stewart 1998). In the last 20 years several thousand aseptically produced young plants have been introduced to 23 localities in northern England, at least one of which is now open to visitors. Although these plantings have suffered very high mortality, and survivors have been slow to flower (Harrap & Harrap 2009), these reintroductions are widely regarded as a qualified success.

Figure 4: Comparison of the last remaining native individual of *Cypripedium calceolus* (left) with a flourishing population of this species in the Vercors region of southeast France (right).
Photos: left by Derek Turner Ettlinger, right by Richard Bateman

The benefits and limitations of conservation genetics

Modern high-profile projects designed to reintroduce, or to bulk up, populations of rare orchids such as *Cypripedium* are often supported by conservation genetic studies. Most such studies are based on several prior assumptions regarding these popu-

lations, most notably: (a) high levels of genetic diversity are beneficial as they permit flexible responses to environmental change, and (b) long-established native populations will have become well adapted to their local environment through the action of natural selection.

In my opinion, neither of these precepts should be accepted at face value. High levels of genetic diversity characterise orchid species that routinely cross-pollinate, whereas dominantly self-pollinating species tend to have less diverse and less flexible genomes. Yet, within the British Isles, this handicap has not prevented the self-pollinating *Cephalanthera damasonium* from becoming more numerous and ecologically tolerant than the cross-pollinating *C. longifolia*. A similar comparison can be made between the widespread self-pollinating *Ophrys apifera* and nationally endangered cross-pollinating *O. fuciflora*. And although the cross-pollinating *Epipactis helleborine* is admittedly more frequent than its self-pollinating descendant, *E. phyllanthes*, the latter will happily occupy more heavily shaded woodland than its fecund forbear; in no way does its impoverished genome appear maladaptive.

Secondly, if long-established native populations are indeed supremely well adapted to their present environments, their exceptional fitness should mean that they will experience little difficulty in countering any foreign invaders that somehow reach their habitats. Admittedly, the increase in the size of the population of putatively foreign Lady Orchids at Hartslock has been no more rapid than that of the native Monkey Orchids, but nor has it been less rapid. The population explosion among the Lonkey Orchids can readily be ascribed to hybrid vigour – a common phenomenon that is a by-product of increased genetic diversity within the individual plants. Assuming that these primary hybrids have high fertility (an assumption that, to the best of my knowledge, still requires confirmation), some back-crossing with the parental species is likely to occur, but the progeny are less likely to show hybrid vigour. Much will depend on the preferences of local pollinators and whether habitat conditions encourage some degree of spatial separation. In this context, it is interesting to note that, despite their increasing numbers, both the Lady Orchids and their hybrid offspring seem inclined to remain in a small area of the Hartslock reserve close to the woodland that crowns the hillside, rather than moving downhill to join the sun-loving Monkey Orchids. Although short, this distance may constitute sufficient spatial segregation to limit gene exchange.

For the sake of argument, let us accept the questionable precepts that (a) high genetic diversity and (b) strong local adaptation are both consistently beneficial. Given that, by definition, small orchid populations can support only a modest amount of genetic diversity, here we have a strong driver for bulking up shrinking populations. And as long-term exposure to local environments improves fitness, here we have a strong driver for maintaining the genetic purity of the population. However, it seems

to me that these two powerful drivers become contradictory once our local population has shrunk to a perilously small size; this process, commonly termed a population bottleneck, afflicted both the Hartslock and Faversham populations of *O. simia* in the mid-20th Century. Once the genetic diversity of the population has been reduced as a direct result of its shrinkage, we can achieve a rapid increase in its genetic diversity only by introducing genes – as plants, or seed, or pollen – from other surviving populations, thus threatening its hard-won local adaptiveness. As conservationists, we are faced with a classic Catch 22 dilemma that offers no easy solutions. Thus, Bateman *et al.* (2008, p. 707) concluded that only "an optimist might argue that a fresh, yet limited, injection of genes from demonstrably successful, expansive plants of a closely related species [*O. purpurea*] … could help to return the Hartslock population of *O. simia* to its former levels of collective diversity and individual vigour."

Another, less theoretical, conundrum is presented by the quantity and nature of the genetic data made available to conservationists. There is a strong temptation to limit the cost of, and time expended on, such a study by focusing the analysis on the population(s) that are causing conservation concern. This tactic usefully allows us to assess levels of genetic diversity in that population, but it prevents us from knowing whether this level of diversity is typical or atypical of the species elsewhere in its distributional range. Divergence from the norm is particularly likely in isolated populations of a species located along the margins of its distribution. It was the fortuitous availability of a large pre-existing body of genetic data on anthropomorphic orchises that allowed Bateman *et al*. (2008) to reconstruct the complex history of the Monkey, Lady and Lonkey Orchids at Hartslock; this in turn led them to identify the Lady Orchids as almost certainly having been derived from a non-UK source.

We should also consider briefly two forms of "unnatural selection" that together fall under the auspices of "artificial selection". Both are forms of directional selection that drive the average appearance and genetic composition of the population in a particular direction through the intervention of man – one of the sources of inspiration for Charles Darwin's profound evolutionary insights. The first, and most clearly damaging, form of artificial selection affecting rare orchid populations I will term 'herbarium selection'. Evidence from the many herbarium specimens collected in the Goring area, together with contemporary accounts by field botanists, clearly reveal preferential selection of the more robust specimens of *O. simia* by Victorian and Edwardian herbarium collectors. It seems likely that their depredations substantially reduced the vigour of the residual population (Bateman & Farrington 1989; Bateman *et al*. 2008), even before extensive ploughing of the site in 1949–50 (e.g. Harrap & Harrap 2009) almost eliminated the remainder and so caused an exceptionally narrow population bottleneck. In fact, I am inclined to attribute the strikingly modest stature of the Hartslock Monkey Orchids relative to most other popula-

tions of the species more to herbarium selection than to reduced population size; not only has overall genetic diversity decreased, but the beneficial genes that allowed plants to reach larger sizes have been preferentially removed from the population. If so, the population may lie further from its adaptive optimum than most observers have supposed.

The antithesis of "herbarium selection" is what Ian Denholm and I mischievously termed "conservation selection" many years ago, in an article published in the internal magazine of the then Nature Conservancy Council (Bateman & Denholm 1982). It is almost inevitable that the vigour of individual plants will be used by conservationists as a proxy for the health of the population that they constitute. The more vigorous plants are more likely to form the basis of breeding programmes, whereas at the other end of the scale of perceived success, struggling and/or diseased plants may be weeded out of the population in a process that owes much to gardening. But natural selection is as fickle and unpredictable as the environmental shifts that drive it, causing the plant to constantly indulge in a myriad of trade-offs needed to balance the many contrasting but essential aspects of its life. Even when we deliberately force a plant towards a clear and simple goal, such as yielding a larger ear of wheat, unexpected negative features usually emerge, such as discovering that the stem is too weak to support the larger ear of wheat. It is remarkably difficult to improve upon nature.

Then there is the question of which kinds of genetic analysis should be applied to the populations of interest. Most regions of most genes, including ITS, tend to show little or no variation within species. In contrast, genetic fingerprinting techniques such as those used in forensic science and paternity cases (e.g. AFLPs and microsatellites) can usually be optimised to identify, and distinguish among, individual organisms. Which of these techniques best reveals genetic diversity within our orchid populations? This is no mere academic query. During the late 1990s, genetic studies of the few individuals of Lady's Slipper remaining in England, both wild and captive, suggested strong similarity with the sole survivor, still hanging on by its root-tips to its West Yorkshire retreat and subjected to routine hand-pollination (Fig. 4). Thus, other individuals suspected to have been brought into cultivation from former native populations were duly crossed with the Yorkshire plant. Seedlings successfully raised from the resulting capsules were then planted out in other carefully selected locations. So far, so good.

However, subsequent analyses using more sophisticated genetic techniques (Fay *et al*. 2009) revealed differences between the genuine wild plant and some of those with which it had been crossed. The decision was therefore taken to uproot some of the recently planted juvenile orchids because of their newly recognised genetic 'impurities'. Rumours suggest that a similar dilemma has been posed by a "brave"

decision to bulk up the formerly small native population of *Orchis militaris* in Buckinghamshire using plants derived from the larger and better known native population further east. Do earlier studies that suggested strong genetic similarity between these two Buckinghamshire populations of *O. militaris* tell the whole story? Was the western population sufficiently threatened to warrant taking the risk of disrupting its genetic cohesion? And, recognising that the resources available to our hard-pressed conservation organisations are unlikely to increase in the wake of the credit crunch and subsequent austerity drive, can we develop protocols that reduce the risk of indulging in further costly and potentially wasteful 'two steps forward, one step back' programmes of species conservation?

Poorly documented introductions undermine conservation and science

'Unofficial' introductions of orchids have a long and questionable history in Britain, and I am hardly the first observer to rail against this practice. For example, arguably the finest UK field botanist of the 20th Century wrote in the *Flora of Surrey* (Lousley 1976, p. 359) that "the doubts attached to the record of a single plant [of *Ophrys sphegodes*] in chalk scrub above Limpsfield are particularly disappointing. In 1942 Dr F. Rose transplanted *O. sphegodes* from Queen Down Warren, Kent, to a Down behind Titsey Church, and Mr Brookes' discovery is thought to be one of the progeny. Thus, Kent has lost the root of a rarer orchid, Surrey has gained a doubtful record, and science [is thus] confused by the unknown history of an abandoned root." And later (p. 360), "*O[rchis] purpurea* has its headquarters in Kent and appears to be making attempts to spread westwards; these take the form of small numbers of plants appearing on the E side of Surrey and usually soon dying out. It is therefore most unfortunate that in 1942 Dr F. Rose sowed seed near the main road up Titsey Hill and failed to keep his experiment under close observation. The site is so near to that of the plant found by Miss Smith in 1959 that it is impossible to say whether this is a natural appearance or not." Two years after Ted Lousley penned these waspish comments, I accidentally encountered my first ever plant of Lizard Orchid, *Himantoglossum hircinum*, in a

Figure 5: A splendid Lizard Orchid photographed in 1978 near Box Hill, Surrey, presumed to have originated from seed deliberately spread at the locality several years earlier.
Photo by Richard Bateman

nature reserve close to Box Hill in Surrey (Fig. 5); only much later did I learn that this too was the result of seed spread several years earlier by Francis Rose. Rightly or wrongly, my excitement at my unexpected find immediately evaporated.

Returning from emotive to more rational arguments, the superb plant atlas of the British Isles produced by BSBI (Preston *et al.* 2002) recognises four categories of residency of plant species in the British Isles. By definition, "Native" plants made their way here by their own devices, whereas species placed in the three remaining categories are considered to have received assistance from man, either deliberately or inadvertently, in reaching our shores. 'Archaeophytes' arrived before AD1500 (most are species connected with early agriculture or forestry; it seems unlikely that Julius Caesar or William the Conqueror brought orchids with them from the Continent), "Neophytes" arrived after AD1500 but are similarly found in semi-natural habitats, and 'Casuals' also arrived relatively recently but have not yet established themselves far beyond human habitation. Of course, assigning any species to one of these categories relies on circumstantial evidence at best, based primarily on historical documentation but supported in some cases with direct dating of the species' arrival from the fossil record and/or indirect dating using genetic diversity measures. Also, should we in fact assign populations rather than species to these categories? For example, it seems reasonable to assume that at least the majority of populations of *Orchis purpurea* in Kent are genuinely native, whereas the population at Hartslock could be accused of being a neophytic interloper.

One problem with uncertainties surrounding potentially man-assisted arrivals is that there is a risk of rejecting as neophytes genuinely natural invasions, particularly where seed can easily be transported by wind (as in orchids) or by animals that indulge in long-distance migration. Given the increasingly well-documented correlation of range expansions and contractions of orchids such as *Himantoglossum hircinum* in apparent response to changes in climate (e.g. Carey 1999), it seems reasonable to assume that the accelerating rate of climate change will rapidly affect populations of at least a significant proportion of our native orchids. Some, such as the Ghost Orchid, *Epipogium aphyllum*, may rapidly become extirpated, but in compensation, new orchid species are likely to invade our islands (Bateman 2006a). The last three decades have witnessed confirmed reports along the south coast of England of one or a few individuals of first *Ophrys balearica*, then *Serapias parviflora* and finally *S. cordigera*. Understandably, these reports were soon followed by arguments regarding the status of these presumed new arrivals; in particular, should they be categorised as bona fide natives or as neophytes? The more tinkering that we indulge in with regard to our native flora, however well-intentioned, the greater is the risk of mistakenly rejecting genuine invasions as mere man-assisted neophytes.

Broader implications: a personal perspective

The study of the anthropomorphic *Orchis* species and hybrids at Hartslock conducted by Bateman *et al.* (2008) could in theory be viewed as a triumph of "forensic conservation". We were able to identify the newly arrived Lady Orchids as being of likely Continental origin and to detect within ostensibly pure Monkey Orchids the traces of past hybridisation with the Military Orchids that grew alongside them in the 19th Century. We were even able to detect low levels of genes derived from Continental rather that British Monkey Orchids. This perplexing result eventually gained an explanation at a HOS meeting, where I first heard the rumour that, in the late 1980s or early 1990s, a single spike of *O. simia* removed from a population in France had provided pollinia that were transferred to some of the Hartslock plants, with the aim of improving the genetic diversity of the population (R. Manuel, C. Raper & N. Phillips, pers. comm. 2008). Admittedly, this in-depth knowledge of the Hartslock *Orchis* population(s) was gained at the expense of considerable time and resources, and as a by-product of a broader, pre-existing study of the genus (previewed by Fay *et al.* 2007).

By now, readers will have ascertained that 30 years of cogitation has left me internally conflicted regarding the key question of when and how conservationists should intervene to rescue (or even resurrect) ailing populations of native orchids. From the perspective of a life-long orchid enthusiast, it is difficult for me to reject any measure that might allow me to continue to visit the orchids that I love in the countryside that I love. Yet even when applying such emotive criteria, I have mixed feelings, recalling my cruel disappointment at discovering my first Lizard Orchid to have been a "fake". This and other similar experiences left me mulling over the question of at what point a supposed nature reserve becomes more accurately described as a botanic garden. On the other hand, at least some forms of intervention have yielded good results. The Hartslock population of Monkey Orchids fluctuated between none and nine flowering plants for two decades before hand-pollination was introduced in 1977; the population began a gradual but steady increase a few years later. Assuming that the expansion was indeed the result of the hand-pollination, this intervention may well have saved the population from extirpation.

Nonetheless, viewing these issues as a "dispassionate" scientist, I question some of the key assumptions that underlie many recent interventions. Even in rare cases when population-genetic data are gathered, different methods of assessing genetic diversity can give radically contrasting results. Routine prescriptions for high genetic diversity combined with adaptation to local conditions are contradictory and so difficult to fill. Moving from genetics to demographics, fluctuating population sizes (especially of flowering individuals) are typical of terrestrial orchids, making genuine downturns difficult to identify quickly. Also, the cause(s) of downturns can be extraordinarily difficult to identify with confidence, especially when (as in most

Figure 6: Is the near-endemic Northern Marsh-orchid of greater value to international conservation than our sole native Lady's Slipper?
Photo by Richard Bateman

cases) the population in question does not have a well-documented history. And lastly, a cold, hard review of species conservation conducted at a global scale, measuring limited available resources against likely medium-term gains, would almost certainly abandon such geographically peripheral populations to their fate. UK specialities such as the Northern Marsh-orchid, *Dactylorhiza purpurella* (Fig. 6), would most likely be deemed of greater international importance than our anthropomorphic orchises or Lady's Slippers.

What lessons do I draw from these experiences? The most obvious and irrefutable conclusion is that all interventions must be subject to thorough, long-term and reliable documentation. The power of undocumented interventions to wreak havoc with both science and conservation has long been recognised but, in my opinion, it has usually been under-estimated. Secondly, given the questionable assumptions that underlie interventions and the decidedly mixed outcomes that have ensued, it is essential that the decline in the relevant population(s) is shown to be long-term and life-threatening. Thirdly, every effort should be made to determine the cause(s) of the decline, so that any attempts to rectify that decline are targeted, and their likely consequences predicted as accurately as possible. It is all too easy to make matters worse rather than better. And lastly, active conservation efforts are undoubtedly most effective when pursued locally, but monitoring and, more controversially, prioritisation of species and sites are better decided nationally or preferably internationally. This contradiction of scale between assessment and intervention will inevitably continue to generate tensions within the conservation movement.

And all this monitoring and remedial work has to be achieved in the context of evermore limited funding and a recognition that, in most cases, the health of the targeted orchid species is likely to rest largely on the health of the entire ecosystem of which it is merely one of many components. This widely accepted truism gives me a welcome opportunity to end by congratulating the committed BBOWT conservationists who have so successfully proctored the Hartslock Reserve, and to state that, despite their dubious parentage and excessive joie de vivre, I still would not advo-

cate expunging the Lonkey Orchids from Hartslock. Rather, I would suggest emulating Parkgate Down but in Oxfordshire, spreading seed extracted from Monkey Orchids in a locality that appears suitable but has not previously supported the species. For me, the Lonkey Orchids remain an interesting ongoing natural experiment in the effects of hybridisation – one "benefiting greatly from the fact that, unlike previous cases of introgression among anthropomorphic *Orchis* species, it will have been monitored since very soon after its inception" (Bateman *et al.* 2008, p. 707). In my view, the Lonkey Orchids have earned their (perhaps transient) place in the sun.

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Croatia: Land of the Falling Lakes

John Spencer, Robert Thompson and Mike Parsons.

Pursued by a cloud of volcanic ash drifting south, which threatened our early departure from Gatwick on 16th May, we barely got away from England for our flight to Split on the Adriatic coast of Croatia. On arrival, we collected our hire car, and found a pleasant, friendly hotel at nearby Tregorski. After a caffeine top up, we dumped our bags and by midday were out orchiding in nearby fields. Unseasonal temperatures, combined with a persistent wind, the Maestral, made photography rather challenging even for the most dedicated photographer.

For those who are not familiar with Croatia, it is a fascinating country of truly outstanding natural beauty, with a dramatic Adriatic coastline rich in pine-fringed beaches, bays and rocky coves that stretches over 1700km in length. There are over 1,100 islands; the vast majority not inhabited, where many orchids perhaps may yet await discovery! Croatia has a fascinating history, occupied in ancient times by the Illyrians, Greeks and Romans, followed by the Celts and finally the Croats. From this melting pot of cultures and civilisations Croatia has developed into a country with a unique character all its own. Croatia comprises five provinces: Slavonia, the furthermost inland, Central Croatia, the largest province, and Istria, Kvarner and Dalmatia, which make up the coastal provinces.

The climate varies depending on which geographical region you are in. Away from the coast the climate is continental with warm summers but cold winters. The coast enjoys a warm Mediterranean climate, which is more stable and generally reliable during late spring and summer. The country is rich botanically, with over 2,500 species recorded and over 70 of these are regarded as endemic. Prior to the Croatian/Serbian war in 1991, it was a popular tourist destination for Europeans and many Britons.

The first site at Zecevo demonstrated that mid-May is too late for a visit to a coastal site in Croatia. The only fresh orchid was *Anacamptis pyramidalis*. Everthing else: *Himantoglossum* (*Barlia*) *robertianum, Orchis quadripuntata, Limodorum abortivum* and various Ophrys, was going over or gone. We promptly moved inland and uphill by making a number of stops along the Drnis to Split road. Initially, the only orchid we saw was *Anacamptis* (*Orchis*) *laxiflora* by the thousand in the flat marshy ground either side of the road. As the landscape became more hilly and wooded we encountered other species. A stop at a roadside pinewood near Kljake

Figure 1: Rough grazing near Cilipi
Figure 2: *Ophrys oestrifera*
Figure 3: *Ophrys oestrifera* ssp. *rhodostephane*
Photos by Robert Thompson


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yielded *Cephalanthera damasonium* and *longifolia, Anacamptis* (*Orchis*) *morio* and fresher *Limodorum*. Here we also saw *rhodostephane*, a ssp of *Ophrys oestrifera* with large dark sepals. On the edge of agricultural land at a village with the memorable name of Muc we found more *laxiflora* growing with *Gymnadenia densiflora* plus budding *Anacamptis (Orchis) fragrans*. Blue Squills and Crested Cow-wheat were mixed in with the orchids and it was good to hear a cuckoo calling even if the temperature had us reaching for our fleeces.

The next day, as we drove south for Dubrovnik, patches of snow remained on the Biokovo range of mountains running parallel to us. To get to Dubrovnik we actually had to cross 10km of Bosnian territory and we couldn't resist a token orchid stop at Neum. Not surprisingly the *Orchis quadripuntata* and *Ophrys incubacea* that we photographed looked very much like their counterparts in Croatia!

A detour along the Peljesac Peninsula, to try and find *Orchis spitzelii* in a pine wood on the edge of Orebic, proved to be fruitless. All we found was a host of *Ophrys liburnica* which had flowered earlier in the year. However, a rewarding stretch of limestone pavement en route, near Mokalo, provided some consolation. *Orchis italica* and *Orchis pauciflora* were going over but *Orchis* (*Aceras*) *anthropophora* was in full flower. *Ophrys incubacea* and some colourful *Ophrys oestrifera* ssp. *rhodostephane* shared what little soil there was with Ground Pine and Gladioli. That evening we made an unfortunate arrival at our Dubrovnik hotel when our satellite navigation directed us through a pedestrianised area.

To show that we were not totally orchid orientated we then took a day off to visit the Old City at Dubrovnik; perhaps the best example of a walled medieval city in Europe. After we had had our fill of churches, forts and museums, it was back to the orchids with visits to a number of sites around the village of Cilipi south of Dubrovnik. A stretch of rough grazing land, which did not look paricularly special from the road, proved to be excellent when we started exploring on foot. *Anacamptis laxiflora* and *Anacamptis morio* were present in such numbers that it was only a question of time before we spotted the hybrid between them. We then found a second hybrid which we decided was *Anacamptis laxiflora* × *Anacamptis fragrans*, the latter species also being present in force. Other species in flower were *Ophrys apifera, Anacamptis pyramidalis* and *Serapias lingua*. Interestingly most of the *apifera* looked well on the way to being var *flavescens* with white sepals and a lip, which quickly faded. The only other *Ophrys* present were *O. oestrifera* in small numbers, along with its ssp. *rhodostephane* and some members of the *O. sphegodes*

Figures 4 & 5: *Anacamptis* (*Orchis*) *laxiflora* × *Anacamptis* (*Orchis*) *fragrans*
Figure 6: *Ophrys untchjii*
Figure 7: *Serapias istriaca*
Photos by Robert Thompson


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tribe which had finished flowering. We did visit two woodland sites, not far from Dubrovnik Airport, but these were not as good. As an indication of how far the season had progressed the large *Neotinea maculata* plants that we found had not only finished flowering but had also set seed! The following day was another non-orchid day simply because we spent all of it driving from Dubrovnik in the south to the Istrian Peninsula, at the other end of the country, in the north. The ten-hour route, which is virtually continual motorway, provided unforgettable views of the many islands strewn along Croatia's dramatic coastline.

To start with, the Istrian Peninsula was disappointing. The Bale area, which by all accounts should have been an orchid hotspot, was quite the opposite with little to be seen. Things improved at Kamenjak where roadside *Serapias lingua* and *Ophrys bertolonii* brought us to a halt. In a small woodland clearing we went on to find *Ophrys bombyliflora, Ophrys incubacea, Anacamptis papilionacea, Anacamptis morio* and a solitary *Serapias parviflora*. Also here were two Croatian endemics. *Serapias istriaca* was similar to *Serapias vomeracea* but shorter and stockier, with a hint of *cordigera. Ophrys untchjii* with its green sepals and square lip had a passing resemblance to *Ophrys bornmuelleri*. Our last site for the day was on a dirt road near Vaituro for two more Croatian specialities. These were *Ophrys tommasinii*, an early flowering "*sphegodes*" and the pink sepalled *Ophrys zinsmeisteri*. The latter species has a lip, which is mostly deflexed to a greater or lesser extent, but you can find plants with flat lips more like *fuciflora*.

Our main reason for visiting Croatia was to see the flora, lakes and waterfalls of Plitvice. This beautiful National Park lies south east of Istria and close to the Bosnian border in limestone country. There are eight designated National Parks in Croatia, each one having a rich and diverse flora and fauna. Forests, cascading waterfalls, rivers and deep blue lakes are characteristic of both Plitvice and Krka National Parks. Plitvice was Croatia's first national park, designated in 1949. It received UNESCO's world heritage status in 1979 and is the largest being about 300 square kilometers in size. It is the most popular of the national parks, receiving large numbers of tourists on a daily basis especially during the summer months.

The plants edging the 16 stepped lakes, that lie on a north south axis over an 8 km area, become slowly calcified by flowing water to form travertine barriers which in turn make the waterfalls more spectacular. The woodland is dominated by beech, oak and fir and there is a rich ground flora. An amazing 1,146 different species of

Figure 8: *Ophrys zinsmeisteri*
Figure 9: *Cephalanthera longifolia*
Figure 10: *Neotinea* (*Orchis*) *tridentata* - white form
Figure 11: *Neotinea* (*Orchis*) *tridentata* - usual form
Photos by Robert Thompson


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plants have been recorded in the park, which is a home for brown bears, wolves and lynx. In addition, 52 species of orchid have been recorded here. However, our efforts pre-trip to come up with some precise information, covering the location of the orchids, had been unsuccessful. The result was that most of the species eluded us. The park is predominantly woodland which provides the ideal habitat for *Cephalanthera longifolia* and *Neottia nidus-avis* which are commonly met with throughout much of the park.

Approaching the park from the north, we stopped near Begoval to view thousands of *Neotinea (Orchis) tridendata* together with smaller numbers of *Anacamptis morio, Dactylorhiza (Coeloglossum) viridis* and *Neottia (Listera) ovata* on open grazing land much like alpine meadows. The weather on arrival was heavily overcast and we encountered occasional light rain, as is often the case in the mountains surrounding the park. However, for the remainder of our stay we were fortunate to have extremely bright and sunny conditions. Our longstanding tradition of not arranging hotels in advance backfired when we arrived at Plitvice, since all three hotels (which are situated within the national park) were fully booked. What we fin-

Figure 12 (above): Lower waterfalls, Plitvice National Park
Figures 13 & 14: *Ophrys dinarica*
Figure 15: *Anacamptis* (*Orchis*) *fragrans*
Figure 16: *Anacamptis* (*Orchis*) *coriophora*
Photos by Robert Thompson


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Figure 13: *Corallorhiza trifida*
Photos by Robert Thompson

ished up doing was renting rooms for three nights in a nearby village, but making use of one of the hotels facilities for all our meals and this arrangement worked out fine. The orchids we did get to see at Plitvice included *Orchis militaris, Ophrys insectifera, Dactylorhiza incarnata, Platanthera bifolia, Corallorhiza trifida,* and budding *Epipactis microphylla* and *helleborine*. Among the many other plants seen were Bastard Balm, Balm-leaved Archangel, Spiked Rampion, and Angular and Scented Solomons Seal. Butterflies included Southern Swallowtail, Scarce Swallowtail, Woodland Ringlet, Pearly Heath, Balkan Green-veined White, Green Hairstreak, Cleopatra, Large Tortoiseshell, Chequered Blue and Red Underwing Skipper plus several day flying moths. Over 300 species of Lepidoptera have been recorded from Plitvice alone.

A word of warning for the would-be visitor: the boardwalks near the bigger waterfalls become very busy and a visit early in the day is recommended. Away from the waterfalls the routes on higher ground through the woodlands yield many interesting plants and insects, among them some impressive longhorn beetles, a number of colorful lichens and fungi. The clarity of the azure-coloured water allows for close-up views of large numbers of fish, which have been identified as being mainly European chub and trout.

On our way back to Split we made one last site visit at a road junction near Ramljane. The main attraction here was a comparatively new species, *Ophrys dinarica*, which appeared to have much in common with *Ophrys zinsmeisteri* mentioned earlier. It was certainly as variable. The lip pattern could be complex or the regular "*fuciflora*" design. The lip shape could be flat or deflexed. Evolution is a slow process and, as a species, it looked like work in progress rather than the finished article. Also here were more of the white-sepalled *O. apifera, Anacamptis pyramidalis,* plus *Anacamptis morio, Anacamptis laxiflora* and hybrids between them. The dark *Anacamptis coriophora* made a welcome change from *fragrans* and we also recorded a single *Ophrys tetraloniae*.

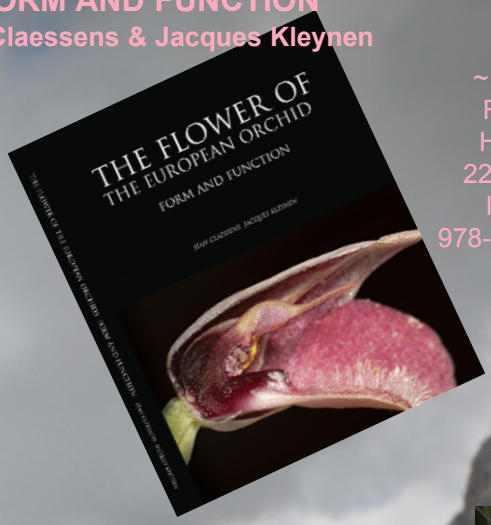
This concluded an enjoyable and at times hectic visit that lasted from 16th to 26th May. On reflection, it might have been better to split our coverage of Croatia in two,

rather than trying to cover all of the country in a single trip, which often required long drives between locations. A two-centre trip perhaps centered at Split and then at Rovinj on the Istrian peninsula would have reduced the long haul drives and allowed us more time in the field. While it was true to say that many of the orchids we encountered were "old friends", we also got to see some of the Croatian endemics. Thanks to Herbert Straeker, Guenther Blaich and Karel Kreutz for the site information.

THE FLOWER OF THE EUROPEAN ORCHID

FORM AND FUNCTION

Jean Claessens & Jacques Kleynen



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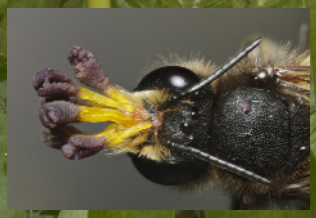

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