



## **Emergency Authorisation Application for the use of Asulam**

For the control of bracken on rough grazing, moorland, amenity grassland,  
forestry and the historic environment in 2018.

### **Supporting Information**

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# 1. Nature Conservation

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## Designated Sites

Bracken can provide an important habitat for specific wildlife species. In some areas, there are positive associations with species such as fritillary butterflies. Bracken can provide a key habitat for upland margin birds, and in some habitats it is an important component adding to structural diversity, especially in rough grassland on the upland margins. However, bracken has serious negative impacts in some habitats and here it requires management. Bracken is often invasive and can dominate other vegetation, leading to changes in livestock grazing patterns (which may then interfere with the use of livestock for habitat management on a site) or out-competing and direct loss of the interest feature for which a wildlife site is designated.

In England and Wales, 60% of moorland is designated for the quality of vegetation or the importance of the habitat to breeding birds (National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC) and/or Special Protection Areas (SPA)). If the vegetation communities, which often form the basis of these designations, are invaded by bracken and out-competed, it has an adverse effect on their conservation status. 70% of English grouse moors are within a National Park or Area of Outstanding Natural Beauty (AONB) and often their heather moorland is the key component of these treasured landscape designations. Allowing heather to be swamped by bracken compromises these designations. Excessive bracken cover is also a concern in some lowland habitats, such as heathlands, which are also of national and international importance.

Control of bracken is therefore widely carried out for nature conservation purposes. Control is a requirement to maintain SSSIs currently achieving or recovering to favourable condition, and in restoring sites, which are not yet recovering. Bracken management is therefore anticipated to play a key role in helping to achieve Government commitments to SSSI targets, and for example in England, contributing to achievement of the requirement to restore 200,000 ha of priority habitat by 2020. Asulam is the only partially-selective tool available to control bracken on a large-scale. To achieve clearance of a particular patch of bracken may require a programme of treatment for up to 10 years.

Bracken can completely re-establish its dominance within about 3 years, so if treatment is not maintained, resources applied to control that bracken would have been wasted; the control programme would need to start again. Much of the cost of such programmes is covered by Government and/or European grants / public money and more still is invested by private individuals. The gains from the large amount of public funds, the resource and the effort that has been invested in bracken control management over the last 10 years will be put at risk if it is not possible to carry on using Asulam to maintain the selective, follow-up treatments on these areas. In addition, if there is a delay in the programme, and bracken is allowed to partly or fully recover its dominance, then it may require more intensive herbicide management to bring the matter under control at a later date. This would be both wasteful of resources and conflict with best practice.

Bracken control is a frequent management requirement in SSSI management plans and exists in agri-environment scheme options to facilitate this activity both within and outside SSSIs. Conservation agencies would generally consider alternative methods to herbicide use as a first option for bracken control, such as grazing, bruising or other mechanical control, and this decision process is set out in the revised "Herbicide Handbook" (Britt et al, 2003<sup>1</sup>). However, where access or terrain make mechanical or physical management difficult, dangerous or impossible (mechanical control is dangerous in MoD sites where ammunition may be a hazard), or where mechanical control is ineffective or poses a risk to other fragile habitats, ground nesting birds, reptiles or scheduled monuments, then chemical control is the only management option available.

In order to control bracken a systemic herbicide is needed (to kill the rhizomes). Asulam has this systemic property, as well as having less negative impact on non-target plants than other effective alternatives, although there is evidence that Asulam can cause damage to other fern, lower and vascular plant species. The conservation agencies have supported research into the risks of asulam to non-target plants (Sheffield et al 2003<sup>2</sup>) and a considerable body of evidence is available in order to enable judgements of risks through drift or overspray onto non-target areas. Such evidence has not been systematically collected for alternative selective herbicides with potential for bracken control.

Asulam is needed for bracken control on lowland (especially heathland but also other grassland) SSSIs, many of which are also designated under the EU Habitats and Birds Directives. Inability to use herbicides for bracken control would risk significant areas of lowland heath returning to unfavourable condition. Large blocks of bracken with a good heathland under-storey can be treated using Asulam and so effectively control the extent of bracken in an area, as long as follow up treatments are applied in subsequent years. Glyphosate cannot be used in the same way without risk of extensive mortality of non-target plants in the under-storey.

As examples of the scale of implication for heathland sites, the majority of the unfavourable Dorset heathland units have a bracken control requirement and there has been heavy reliance on Asulam in heathland restoration projects, for example in the Thames Basin Heaths area, where there has been a major effort to expand heathland following conifer removal.

In both the uplands and the lowlands, there are a number of SSSIs where herbicidal control of bracken is carried out for biodiversity conservation purposes. Herbicides are used in the preparation of ground for establishment of woodland for biodiversity and its use is of major importance for the protection of archaeological sites many of which are scheduled monuments. In both cases it is important to minimise any effects on non-target plants to maximise re-establishment of ground flora. The extensive use of Asulam in the uplands for agricultural and sporting purposes has often prevented

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<sup>1</sup> Britt, C, Mole A, Kirkham F and Terry A (2003) *The Herbicide Handbook*. Guidance on the Use of Herbicides on Nature Conservation Sites. English Nature Report under contract EIT 31-04-003. English Nature 2003. Updated by Natural England 2011.

<sup>2</sup> Sheffield E, Johns M, Rumsey FJ, and Rowntree JK (2003) *An investigation of the effects of low doses of Asulox on non-target species*. English Nature contracts EIT20-19-001 and EIT30-08-07. Peterborough. English Nature.

bracken becoming a specific conservation issue in such areas, and inability in the future to carry out selective herbicidal control is likely to result in an impact on favourable habitat condition in such areas.

In general, a programme of herbicide use is needed over a number of years to achieve complete control as bracken vigour is progressively reduced over a number of seasons of control. This programme is still underway in many SSSIs and under agri-environment scheme agreements. Where completion of a control programme cannot be achieved, there is likely to be rapid reversion to bracken dominance and loss of the gains made in preceding treatment years.

## **Cutting**

Cutting is often not a practicable alternative to chemical control with a selective herbicide like Asulam in heather moorland areas. Experiments on the North York Moors have shown that cutting cannot achieve clearance unless it is done at least 3 or 4 times per growing season, to a very low level below the height of surrounding vegetation and for at least 3 or 4 years successively. Labour costs make this impracticable in many situations. It is not possible to cut bracken with machinery low enough without risking damage to other vegetation and/or causing damage to surface peat that can lead to an erosion risk. Furthermore, mechanical cutting may cause damage to known and unknown archaeological interest preserved in the peat.

## **Requirements from conservation agencies**

### **Natural England**

Whilst bracken can provide an important habitat for wildlife, it also has serious negative impacts in some habitats and here it requires management. The key habitats on which bracken can have a major negative impact are drier upland peat moorland, upland wet/dry heath and lowland heath. Dense bracken cover remains the reason why many lowland heathlands in Sites of Special Scientific Interest (SSSIs) are assessed as being in unfavourable condition and is a cause of unfavourable condition or a threat to many upland SSSIs. Dense bracken out competes typical heathland species and destroys or obscures valuable features such as bare ground or short vegetation that is important for many heathland species. Other effects include the negative impact on both natural regeneration and new planting in woodlands, whilst bracken rhizome damage to historic and archaeological features has become a major issue.

Control programmes are in place to attempt to halt and reverse this process on many SSSIs. Schemes exist to help fund farmers and land managers carrying out bracken control measures for nature conservation and historic heritage purposes under various agricultural support programmes associated with Rural Development Programmes in Britain. In England, almost 25,000 ha received payments for bracken control (all methods) in 2016, whilst in excess of 2,200ha of SSSI were treated with asulam by aerial application (based on consultations received from aerial spray operators). The continuing importance and ability to manage bracken in schemes, where there is public funding, is a priority.

The British Isles contain a major part of the world resource of managed heather dominated habitat and England in particular accounts for 23% of the total drier upland

heather-dominated phase. In 2008, it was estimated that almost 35% of this drier moorland/heathland area was degraded and/or at risk of bracken encroachment. By 2011, this had reduced to 24% largely as a result of Environmental Stewardship Schemes. By 2015, the figure came down to 19% and this should reduce further if bracken control is successfully maintained through grant-aided operations. Over 850ha of former bracken dominated land has been fully regenerated to dwarf shrub (heather) in the last 6 years in the North York Moors alone, and the combined figure for Northumberland/Durham, the Yorkshire Dales, Peak District and the rest of North Yorkshire/South Cumbria comes to over 1,250ha.

Although at some sites bracken control can be achieved to a degree by mechanical cutting or other non-chemical control techniques, it is not always possible. For example, if the site is too steep or the terrain too uneven or rocky, mechanical control is not possible and chemical control is the best option. At present asulam, under the current Emergency Authorisation, provides the systemic action needed to kill bracken rhizomes, whilst having greater selectivity on non- target plants than other effective alternatives.

Following its withdrawal of approval, and alongside the manufacturer's application for full re-authorisation of asulam, the conservation agencies, with other partners including Historic England and members of the bracken control industry, have supported field trials to investigate the relative efficacy of Asulam against two potential alternative (Sulphonyl Urea) herbicides as bracken control agents. These trials are intended to evaluate relative control efficacy of the herbicides, using different application methods, as well as to give an indication of their overall impacts on non-target plant species. If successful the results will be used to develop control protocols acceptable to the different interests involved. The trials have been established at 12 locations (19 actual trial sites) in England and Scotland to represent a range of geographical, soil and climate conditions, and hence a range of different vegetation communities that may be affected. Given the long response time of bracken (and some non-target plants) to herbicide treatment, we expect that trials will need to continue to 2018 in England, and 2019 in Scotland, in order to evaluate vegetation responses.

### Scottish Natural Heritage

The scale of requirement for Scotland was indicated by the figures for bracken management options funded through the Scottish Rural Development Programme, as at January 2011. It should be noted that figures for SSSI and Natura areas are approximate, and not all may relate to application of asulam to designated sites since some may include areas of application adjacent to those sites:

- **On SSSIs:** 104 cases of the option 'Bracken Management Programme for Habitat Enhancement' had been approved on fields that overlap SSSI boundaries. This comprises 155 fields, which overlapped SSSIs to the extent of around 49,191 ha.
- **On Natura 2000 sites:** 84 cases had been approved, made up of 128 fields with an overlap with Natura 2000 sites of around 35,497 ha.
- **SSSI and Natura combined:** 116 cases had been approved, made up of 175 fields with an overlap of 58,023ha.

## 2. Human Health Impacts

Author: Professor Roy Brown

Bracken has direct and indirect impacts on human and animal health.

### Direct Impacts

The plant contains 28 groups of chemicals, which form part of its natural defence system. These groups can have a range of effects if the plant is eaten or if water, which has picked up exudates derived from the plant or the litter, is consumed. There is evidence that inhaling or ingesting spores from bracken may also be harmful in a number of ways. Research over the years has indicated direct poisoning and inflammatory effects, teratogenic (monster forming) effects in unborn mammals, as well as carcinogenesis, particularly in connective tissue and bone. The passage of carcinogenic chemicals from dairy cattle to human beings has also been confirmed in other countries where bracken is widespread in dairy pastures. This was not thought to be an issue in the UK, but recent evidence means it cannot be completely discounted.

### Indirect Impacts

#### Tick Borne Diseases

The environment created by bracken beds has been shown to favour Sheep Tick *Ixodes ricinus* activity with up to 70% of all tick activity in heath and dry moorland areas associated with bracken dominated habitats. In addition to causing damage by simply sucking blood from a host, especially if the puncture sites become inflamed, ticks carry a range of Tick Borne Diseases (TBD) which affect humans, mammals and birds. The main tick transmitted diseases affecting humans in the UK are Lyme Disease, Tick Borne Fever (*Anaplasmosis*), Louping Ill, *Babesia* and infections created by the bacteria *Staphylococcus aureus*, although several other pathogens are transmitted and may cause problems, especially if in a 'cocktail' of TBDs transmitted by a single bite.

#### Recreational Use and Occupational Groups at Risk

Bracken is often most extensive in lowland heath and drier moorland situations, as well as in certain pastures, grass rough grazing and on woodland floors. These are frequently designated, for example Area of Outstanding Natural Beauty, National Park or Forest Park, and attract outdoor recreational activities such as walking and cycle riding. Levels of recreational use may be high, especially at times of the year when 'questing ticks' (those actively searching for a blood feed) are at their most active. Foresters, Farmers/Shepherds, Gamekeepers, Countryside Rangers and Wardens are at increasing risk as well as visitors to areas where ticks and TBD are endemic. The ability to at least regulate and reduce the risk of tick bite can only be achieved by controlling these extensive bracken habitats by aerial application of Asulox (Asulam).

#### Tick host activity

The sheltered environment created by dense bracken beds makes them attractive as resting areas to large herbivores, such as sheep and deer (mainly Red Deer). Unfortunately, these animals are also the major hosts for the four life stage Sheep Tick, the female of which requires three blood feeds at different life stages to complete her life cycle of laying eggs, normally over a two or three year period.

## Risks

### Direct risks

Whilst there is debate over the significance of bracken in situ causing direct health problems to humans (few people eat bracken, but there are local water supplies affected by it and in years when heavy sporing takes place, people inhale the dust) there is little doubt of its negative impact on farm and wild mammals, as well as ground nesting wild birds in particular.

Sporing depends on conditions and tends to be associated with excessive drought years, but it is highly variable in terms of time and distribution. There seems to be an underlying cycle of between 8 and 12 years. The very edges of the pinna (leaf) turn under to develop and protect the sporing centres giving the impression of early senescence, normally late July to mid August.

Therefore the existence of beds, which have shown dramatic extensions due to environmental and management changes over the last 80 years, is a major problem in animal health and welfare terms.

### Indirect risks

There has been a dramatic increase in diagnosed TBD in the UK and many cases remain undiagnosed (although frequently 'blanket treated'), especially Lyme Disease of which there are now at least three strains in England and Scotland. Whilst greater awareness and improved diagnostic methods partly explain the recorded increase, there is an upward trend as records from three Districts in Somerset where a high standard of accurate diagnosis has been in place since 1997.

Frequency of Lyme Disease (*Borreliosis sensu lato*) from Seven General Practitioner Surgeries in Somerset 1997 to 2016.

Year	1997	1999	2000	2001	2003	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. of Cases	3	5	6	8	11	16	18	20	23	26	19 <sup>1</sup>	17 <sup>1</sup>	24 <sup>1</sup>	26 <sup>2</sup>	29 <sup>3</sup>	36 <sup>3</sup>

#### Notes:

1. The reduction in 2011 and 2012 was largely due to fewer cases being diagnosed in the three practices associated with the Quantocks area, almost certainly a result of the reduction in the bracken habitat. Lack of funding restricted the level of follow up from 2012 onwards and numbers have increasing dramatically again.
2. Based on partial data only.
3. It was possible to do resurveys in 2015 and 2016 when the highest number of local diagnoses ever made have been recorded. Unfortunately it will not be possible to continue data collection beyond September 2017.

The common denominator is extensive bracken cover, frequently on difficult ground. Whilst there are several alternative methods to control bracken on a small scale there is no alternative but to aerially control rough heath and moorland areas. The only chemical suitable for such control work is Asulox (Asulam), which also has limited

impact on non-target species and habitats.

The potential impact of not being able to control large areas of bracken using the Asulam molecule is best illustrated by reference to the Quantock Hills programme.

## **The Quantock Hills Study**

Nearly 22% of the open hill area of the Quantock Hills AONB was covered in bracken in the early 2000s. The negative impact on habitat, stock health and grazing was well established and by the time the increasing levels of tick activity and prevalence of tick borne disease pathogens was established in 2007, both the conservation agencies and land managers were keen to reduce the area lost to bracken and at the same time lessen the negative economic and health issues as well.

In 2009, almost 800ha of bracken encroached land was controlled by aerial application of asulam under a Higher Level Stewardship Scheme with funding from Natural England. This represented 73% of the total bracken area on the hill. Earlier trial work by the author, in the 1990s, had demonstrated that the loss of favourable tick habitat dramatically reduced activity. Prior to the spraying in 2009, and on an annual basis since, the condition of the sprayed area (which is now on a follow-up programme to restrict regrowth) and levels of tick activity have been monitored on 14 fixed sites along with 4 untreated sites, where bracken has not been cleared. The dynamics are summarised below.

The combination of providing favourable habitat for tick activity, the attraction of intermediate hosts and the patterns of outdoor recreation mean that extensive bracken beds often pose an increasing threat to human health. The work carried out on the Quantock Hills by Brown has shown that the favourable habitat for sheep ticks increased between 1991 and 2013.

Bracken beds have the potential to support disease vectors and the pathogens themselves via the reservoir hosts. The changing relationships and increasing risk factors were reported in this Study in 2008, and this provides a template for what is happening in many rural areas.

In 2009, almost 800ha of bracken encroached land was controlled by aerial application of Asulox<sup>®</sup> under a Higher Level Stewardship (HLS) Scheme with funding from Natural England. This represented 73% of the total bracken area on the open hill area. Earlier trial work by Brown in the 1990s had demonstrated that the loss of favourable habitat dramatically reduced tick activity. Prior to the spraying in 2009, and on an annual basis since, the condition of the sprayed area (which is now in a follow up programme to restrict re-growth) and levels of tick activity have been monitored on 14 fixed sites along with 4 untreated sites where bracken has not been cleared. The dynamics are summarised below.

**Mean Number of Sheep Ticks (*Ixodes ricinus*) / m<sup>2</sup>  
on the Quantock Hills Trial Plots**

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>A. Areas sprayed in 2009</b>									
Larvae	14.5	15.1	16.8 <sup>1</sup>	13.1 <sup>1</sup>	2.7 <sup>1</sup>	3.1 <sup>2</sup>	5.9 <sup>3</sup>	6.2	7.8
Nymphs	6.3	6.2	0.7	0.2	0.1	0.3 <sup>2</sup>	1.0 <sup>3</sup>	1.1	3.9
Females	3.1	2.9	0.3	0.1	0.05	0.1 <sup>2</sup>	0.6 <sup>3</sup>	0.3	1.1
<b>B. Control Areas not sprayed in 2009</b>									
Larvae	14.6	15.3	15.7	16.1	17.2	17.8 <sup>2</sup>	18.6 <sup>3</sup>	18.5	19.4
Nymphs	6.2	5.9	5.6	4.9	6.1	6.9 <sup>2</sup>	7.2 <sup>3</sup>	8.2	8.9
Females	3.2	3.1	2.9	2.2	3.1	2.9 <sup>2</sup>	3.3 <sup>3</sup>	4.0	4.2

*Notes:*

- 1. The increase in larval activity is related to accelerated hatching rates due to changes in the critical humidity levels in the exposed bracken litter once the canopy has been removed. Since year 4 (2014), reduction in larval activity has been in synchronisation with the nymph and female reduction profiles.*
- 2. The increases are probably due to some areas no longer being followed up properly, but the difference between controlled and uncontrolled areas remains striking.*
- 3. Note the contrast between the control and treated areas. Within the treated area numbers are increasing again due to the recreation of the dense bracken habitat in some places, but there is also a general upward trend in the control areas due to background favourable conditions (weather and host availability).*

The results show clearly that by year 3, after control, tick activity at all life stages was reduced by at least 60%, and at this time reduction by 90+% was projected by year 5. This reduction was not quite reached because of some bracken habitat regeneration and there are now signs of a reversal.

This is the first time such a large scale scheme has been carried out and the results show very clearly that if the ability to carry out further schemes at this scale, as well as to maintain the many smaller, but still highly effective schemes which have been established elsewhere is removed, then one of the main weapons in tick control will be lost. Currently only aerially applied Asulox® can deliver the primary control and follow up required. If alternatives can be put in place, this will take between 4 and 6 years from now, so the survival of the Asulam molecule for use in Europe is vital.

## **The Bransdale Moor Study**

Since 2009, a long term integrated study, assessing the impact of bracken control with Asulam on tick activity, Red Grouse and Sheep welfare on Bransdale Moor has been in progress, with 2017 the report-back year.

In 2008, a comprehensive assessment of bracken cover, tick activity and tick-borne disease was undertaken, prior to developing a long-term Moorland Management Programme for this important Red Grouse, sheep grazing and recreational moor covering 6,000ha of the North York Moors National Park. The survey identified large areas of bracken, 9 of which, covering 18% of the total moor area, were heavily bracken infested and 'hot spots' of tick activity. The survey also established that there were a number of pathogens, which were likely to affect birds, wild mammals, farm mammals, companion animals and man, present in the tick population (i.e. *Borrelia* x 2 strains; *Ehrlichia*, *Rickettsia* x 2 species, and *Babesia* [Brown, 2017]).

In 2009, a programme of intervention was started that includes an integrated bracken control programme and treatment of stock with vaccines and acaricides.

By July 2017, known areas of intense tick activity (>1 questing female per 25m<sup>2</sup> sample block) had been reduced by 78%. All of the original 9 'hot spots' were virtually tick free and the area of dense bracken on these key sites had been reduced from 18% to 5% of the moor. Overall, levels of tick activity were down by 70% and the incidence of key TBDs in subsampled areas in Red Grouse was down by 84% and in Sheep by 92%.

This is particularly important, as one disturbing national trend, that of increased incidence of ticks carrying multiple pathogen loads, has been identified on Bransdale and 7 other moors sampled in the North York Moors alone. The incidence of questing ticks, with 2 or more potentially disease causing pathogens in them, rose from 0.2% in 2009 to 6% in 2017.

This study underpins the importance of an integrated host/habitat manipulation approach to reducing the threat of disease to humans and animals and highlights that the most significant single factor is large scale control of dense bracken, which can only be achieved by aerial application of Asulox (Asulam).

The level of control achieved on Bransdale has been replicated on three other, smaller moors locally and could be repeated in most of the moorland, heathland, scrub woodland and unimproved / semi improved grasslands of the UK.

## **Lyme Disease and Public Access**

There are no up to date official figures for the number of confirmed reports of Lyme Disease in England, Wales and Scotland.

Numbers increased from 200 in 1999 to almost 1,600 in 2009, according to data from the Health Protection Agency and Health Protection Scotland. More recently, Public Health England estimated that in England & Wales there are now between 2,000 and 3,000 cases each year<sup>3</sup>, although it is thought that many cases go unreported. The latest report from Public Health England is that there were 3,280 cases in the year.

All moorland is open access for walkers and is criss-crossed by a network of rights of way, bridleways, byways and various permissive access routes used by walkers, horse

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<sup>3</sup> Public Health England guidance published on 13 May 2013 - <http://goo.gl/mLfPhf>

riders and mountain bikers. Bracken is a physical barrier to access. Health & safety advice recommends that anybody passing through stands of bracken in the summer, when bracken could be sporing, should wear a facemask.

If asulam is not available, the ability to control bracken will be much reduced. This will allow bracken to increase its area of dominance, restricting public access and posing an increasing threat to human health.

### **3. Alternatives**

Possible alternatives to Asulam are being investigated, but even if these prove viable and acceptable in safety terms, the likelihood of them being available for large-scale control within the next five years is very slim. None of the alternative products being considered share the selectivity properties of Asulam, which is a key feature that allows asulam to be used with minimum risk in the environment.

The on-going National Trials on bracken control chemicals, which come to an end in 2018, have demonstrated again in 2017 that overall Asulam is the most effective product in terms of bracken control and low level of impact on non- target attributes.

A table that compares the relative efficacy and safety of Asulam against three other control chemicals is at Appendix 1.

### **4. Conclusion**

The direct and indirect risks to human health associated with bracken have been highlighted. These risks apply to people working on open ground in the countryside and even larger urban parks, and visitors to these areas<sup>4</sup>.

Controlling bracken can mitigate the risks to human health and Asulam applied aerially is an important tool for this work, especially on large-scale bracken beds in remote areas where access by ground based equipment is difficult, or impossible.

It is hoped that registration of Asulam in Europe will be achieved soon, but in the interim it is considered vital that Asulam remains available under emergency authorisations to maintain those control programmes that are in progress and have already received considerable investment, and to provide an ability to initiate new control programmes.

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<sup>4</sup> See the Daily Telegraph report about Matt Dawson contracting Lyme disease after a tick-bite in Richmond Park. <https://goo.gl/32ehzT>