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The Conservation of Bats in Europe

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Much of Europe was forested four thousand years ago. These ancient woodlands were native habitat for bats, who are thought to have evolved in places such as this. As long ago as neolithic times, trees were burned to clear land for agriculture. Later they were felled to provide timber to build ships and houses, to make telegraph poles and to shore mine tunnels, and to provide charcoal to fuel the iron industry. Woodlands provided a diversity and abundance of insect food for bats, as well as offering many places for them to roost in tree hollows or under bark. But as they were cleared, these valuable resources steadily diminished.

Despite clearing of the forests, many new roosting opportunities arose for bats as humans built structures to house themselves and their domestic animals, to worship their gods, and to defend themselves. Because of the low thermal conductivity of wood, many bat species prefer it as a roosting substrate, "following" the timber into the structures that people built. (The lower the conductivity of the roosting surface, the less a bat's body heat will be depleted.) Bats continue to make extensive use of roof spaces and other cavities in human-built structures for roosting, especially during summer. Medieval strip agriculture was replaced by small fields divided by planted trees and hedgerows, and together with permanent pasture, they provided a rich source of insect food for these bats.

To hibernate, some species extended their habit of burrowing into the rubble on cave floors, by making similar use of the rubble between the walls of stone dwellings. Human activities provided bats with other new roosting opportunities as well. Mining intensified with the need for flint to make arrowheads and axes, for chalk to spread lime on fields, and later, the need for other minerals to fuel the industrial revolution. As mines were worked out and eventually abandoned, bats moved in, particularly to hibernate.

Since the time when neolithic man began to alter his environment, until the second half of the twentieth century, roosting opportunities for bats were highly dynamic. As some were lost, others presented themselves. These changes, however, must now be seen against the background of an environment that is continually degrading. Throughout Western Europe, the mechanization and intensification of agriculture following World War II resulted in the widespread loss of hedgerows, trees, and permanent pasture. Together with extensive draining of wetlands and planting of alien conifers, insect diversity has been greatly reduced.

We might predict that bats, as flesh eaters who feed on insects, would be able to adapt to changes in insect diversity as would a true carnivore. Instead, bats evolved a highly sophisticated prey-detection system. Some species, in fact, may be so specialized in their foraging behavior as to be seriously compromised by the reduction of certain groups of insects.

For example, the population decline of large beetles resulting from loss of permanent

pasture may have a serious effect on the greater horseshoe bat (*Rhinolophus ferrumequinum*), a species that relies heavily on such beetles for food. More recently the widespread use of highly persistent antiparasitic drugs on domestic livestock, which reduces the invertebrate fauna associated with their dung, has further affected beetle populations and, therefore, the greater horseshoe bat.

Insect diversity and abundance has also been seriously affected by industrial pollution and agricultural run-off into river systems. Emissions of sulphur dioxide from the fossil fuel power stations of Western Europe have caused widespread death of trees and acidification of lakes in Northern and Central Europe. In the East, the extent of such pollution in some former Soviet bloc countries has become horrifyingly apparent as the Iron Curtain has lifted.

Moreover, the widespread use of agricultural pesticides has resulted in an accumulation of toxic residues in bats. Another significant source of poisoning in bats comes from the ongoing renovations of older houses, which involves the extensive use of remedial timber treatments. High concentrations of chlorinated hydrocarbon insecticides and fungicides are sprayed onto roof timbers to protect them against infestations of wood-boring beetles and timber-rotting fungi. Bats present at the time of treatment inevitably die, and those returning later either inhale the vaporized chemicals or ingest them after grooming fur that has been in contact with treated timber.

Repairs to stone buildings and bridges and the conversion of obsolete farm buildings into dwellings results in further loss of bat roosts. Another factor is disturbance in caves. As people have acquired greater affluence and leisure time, a growth in recreational caving activities has taken place in Europe, as well as in the United States. Although the majority of cave explorers are responsible people, increased disturbance often degrades the quality of bat roosts. Some caves have been used as dumps for domestic refuse and animal carcasses, while others have been developed as tourist attractions. Many old mine workings, also extensively used by bats, and even natural caves, have been sealed to prevent accidents to people and livestock.

All these changes have resulted in the widespread conclusion among bat biologists and conservationists that the numbers of bats of most species are declining throughout Europe. The evidence was assembled by Dr. Robert Stebbings, one of BCI's first trustees, in his book *Conservation of European Bats*, published in 1988, the European Year of the Environment. Thirty bat species are known in Europe today, but local extinctions have already occurred, and all but three are considered to be endangered, rare, or vulnerable.

It is difficult to obtain relative population estimates for many bat species mainly because, as radio-tracking studies continue to demonstrate, our knowledge of where they roost is far from complete. For this reason, it has often been difficult to quantify the decline in bat numbers beyond the unanimous reports of the older generation that "there aren't as many around" as when they were young.

The destruction of bat roosts, however, has been well documented throughout Europe. A prime example is the loss of some of the ancient and extensive limestone mines in South Limburg in the Netherlands, to the cement industry. In the United Kingdom the greater horseshoe bat is rare and confined to southwestern England and southern Wales. Because this bat hangs free and obvious, its roosts are easier to locate than those of crevice-dwelling bats, and their decline has been well documented. Today only about 3,000 remain from a much healthier historic population.

The same applies to the mouse-eared bat (*Myotis myotis*) in southern Germany, where only 20 percent of previously known roosts are now occupied. Annual counts of bats of several species at maternity roosts and hibernacula have shown consistently downward trends--the results of a U.K. house-bat survey suggesting a substantial reduction in bat numbers over a 10-year period.

It has been possible to obtain information on the size and history of some colonies by excavating their guano piles beneath roost sites. From this we can see that catastrophic events, such as remedial timber treatments, coincide with the dramatic reduction in bat numbers and subsequent guano deposition. Bechstein's bat (*M. bechsteini*) is so abundant in the fossil record, particularly in cave deposits, that it must once have been far more common in Europe than it is today.

While all this paints a dismal and depressing picture of the plight of bats in Europe, European bat conservationists are not, however, totally discouraged. Quite the reverse. They are working energetically and enthusiastically in many exciting ways to reverse these trends. Their numbers and resources continue to grow, and their efforts have resulted in some real successes.

Whether by the efforts of conservationists or as a result of other factors, some species, such as Daubenton's bat (*M. daubentoni*,) are thought to be increasing in numbers throughout Europe, and the serotine bat (*Eptesicus serotinus*) is also thought to be increasing its range.

Legislation is an important foundation for bat conservation, but it is inadequate when it protects only bats and not their roosts and feeding habitats. Many countries have neither the will nor the resources to enforce such laws, even though laws to protect bats have been passed in almost all European countries. Such legislation came into force as early as 1880 in the Netherlands, at the turn of the century in Hungary, and before 1940 in Austria, Finland, Germany, Italy, Liechtenstein, and Portugal.

The United Kingdom was slower to pass legislation protecting bats. In 1975, the Wild Creatures and Wild Plants Act protected the two most endangered species in the U.K., the greater horseshoe bat and the mouse-eared bat. Since the public is unable to distinguish between bat species, the publicity given to this Act benefited all U.K. bats.

A real breakthrough came with the Wildlife and Countryside Act of 1981, which protects all bat species *and* their roosts. A tidal wave of interest in bats swept across the country, stimulated by a hard core of a few dozen bat enthusiasts--amateur and professional--who for many years had constituted the Bat Group of the Mammal Society. In 1984, a seminar on bat conservation held at the meeting rooms of The Zoological Society of London, with a capacity of 250, was oversubscribed by 100 percent, and had to be repeated the following day. After this, amateur bat groups were rapidly formed throughout the U.K., and there are now over 90 with a total membership of about 2,000.

The Bat Groups of Britain were originally supported by the Fauna and Flora Preservation Society (FFPS), the Vincent Wildlife Trust (VWT), the World Wide Fund for Nature, and The Nature Conservancy Council. Three conservation officers, led by Tony Hutson, were employed on The Bat Project to provide advice, support, and publicity material. Leaflets on individual bat species, slide packs, and booklets were made available for members of bat groups to use when interacting with roost owners and other members of the public.

The amateur bat groups of the U.K. are a distinctive and unique phenomenon as yet unparalleled elsewhere in the world. Their most important function has been to assist the statutory nature conservation organizations to fulfill their responsibilities under the Wildlife and Countryside Act. Such organizations are charged by the government to implement legislation affecting wildlife.

The Act prevents householders who share their houses with bats from disturbing them without contacting an official nature conservation organization. These organizations, short of resources, rely heavily on highly motivated amateurs to carry out roost visits. They license these activities, and issue such licenses only after extensive training and knowledge of The Bat Workers' Manual, which contains practical guidance and basic aspects of bat ecology.

Perhaps the greatest single achievement of the Bat Project was organizing the National Bat Year in 1986, a sustained publicity campaign that added a great deal of momentum to the ongoing process of changing public attitudes about bats. The success of this campaign is exemplified by the fact that the majority of the thousands of telephone inquiries dealt with by the U.K. bat conservationists each year are from members of the public who are now aware that bats are protected.

Bat conservationists formed their own organization after the FFPS and VWT withdrew from the project due to financial and other constraints. The Bat Conservation Trust is now the U.K.'s only fully constituted private conservation organization for bats. Supported by grants, memberships, and benefactors, it employs five staff. The Trust continues to provide vital logistic support for bat groups, furnishing publicity material and educational information for bat workers, roost owners, the public, and schoolchildren. It also produces a quarterly newsletter and organizes the National Bat Conference, an event characterized by the refreshing and infectious enthusiasm of several hundred amateurs sharing ideas and experiences. Such meetings also provide an important training function with a series of instructional workshops available each year.

Britain is not alone in having a well-organized infrastructure for bat conservation. The Netherlands, Switzerland, Germany, and France all have active bat conservation organizations or research foundations. In Czechoslovakia a Bat Conservation Trust was founded in 1991 by BCI scientific advisory board member Jiri Gaisler, and in Poland, The Polish Society of Wildlife Friends Pro Natura is preparing a bat protection program for the country.

Such infrastructures provide a means of organizing and coordinating activities within and between countries. Assisting with this process, the European Coordinating Panel for the Conservation of Bats in Europe, which was established in 1990, held its first meeting early in 1991. Hosted by Gaisler, participants gathered to discuss the problems of censusing and monitoring bats and to gain firsthand experience in counting hibernating bats in caves.

Bat conservationists in Eastern Europe have also benefited from increased contacts with their colleagues in the west. Because of a lack of convertible currency, Eastern European bat workers were unable to import bat detectors, books, and mist nets. The Bat Support Fund for Eastern Europe, established in 1987 by Dutch conservationist Peter Lina, raised the money to send them the needed material.

Much of the information that European bat conservationists obtain on the status of bats comes from bat detectors. The use of detectors for surveying and monitoring was

developed in Europe principally by Danish, German, and Swedish ecologists. Dutch bat biologists convened the first European bat detector workshop in 1991 to provide training in species identification and to define habitat features important to bats. In addition, detectors were used to follow foraging bats back to hitherto undiscovered roosts. The workshop was very successful and a similar one was held in England in the summer of 1992. Those who attended are now introducing the techniques to their bat groups.

The first nationwide bat habitat survey in the U.K., which spanned three years, was recently concluded. Volunteer bat workers were allocated kilometer squares and asked to walk transects at night with bat detectors to monitor the abundance of bats in different habitats. Such information, when analyzed, will help shape future land-management policies, and if repeated in future years could provide a comparative index of population trends. Portugal, Switzerland, and the U.K. have already produced Action Plans for bat conservation, and such plans are in preparation in Poland and Spain.

Theidentification and protection of roost sites continues to receive high priority throughout Europe. Structures built by humans often provide important bat roosts in a region where natural roosts have been severely degraded. Medieval country churches provide a constant thermal environment for bats; by buffering the fluctuations in external temperature, they remain relatively cool in summer and warm in winter. A survey was initiated in England in 1992 by contacting 8,000 clergymen to evaluate the importance of churches as bat roosts. Similar surveys of farm buildings and hibernation sites are also underway.

One of the most successful campaigns in recent years prevented the storage of radioactive waste at Nietoperek in western Poland, the most important hibernation site for European bats *[BATS*, Spring 1991]. During World War II after Germany invaded Poland, the eastern approach to Berlin was protected with a network of fortifications connected by some 18 miles of concrete underground tunnels, incorporating a narrow-gauge railway. Originally well-drained, the system is now partially flooded to provide a gradation of humidity, air flow, and temperature, which provides ideal hibernation conditions for 30,000 bats of 12 species.

Plans by the Polish government to use part of the system to store radioactive waste were abandoned after a massive international publicity campaign. Local bat workers, members of the Lubuski Nature Club, who worked tirelessly to protect the site, have been encouraged by annual visits of colleagues from Western Europe. Unauthorized access to the hibernaculum, which is a designated nature reserve, has been prevented by the local authorities who have erected protective gates at entrances. Regular censuses throughout Europe showed many years ago that installing carefully planned gates at the entrances to cave hibernating sites resulted in a dramatic increase in the numbers of bats using these sites.

Other fortifications dating from the 1870 Franco Prussian War, and extended during the two World Wars, now provide a vast network of hibernacula for bats in Western Europe, part of which is regularly monitored by a multi-national team. Such wartime fortifications are invariably very strongly built and some of the machine gun or observation posts still evident throughout the U.K. have been converted to bat hibernacula.

A relatively new initiative originating in the Netherlands and now adopted in the U.K. is the creation of artificial hibernacula. Using concrete pipes covered with earth and lined with bricks and stones, these hibernation sites are relatively recent additions to the bat conservation scene. Although they have yet to attract large numbers of bats, it takes time

before bats will use such artificial roosts, as has been learned with bat boxes.

The use of bat boxes has been one of the most successful conservation schemes throughout Europe, and is particularly useful in providing roosting opportunities where few exist, such as in conifer plantations. Bat boxes are most successful when large numbers are deployed, and to avoid disappointment they are no longer recommended for individual use in gardens in the same way as bird boxes.*

They are occupied throughout the summer, sometimes by large numbers of bats. In Sweden, the Netherlands, and the U.K., pipistrelles set up territories in bat boxes, using them as mating roosts in autumn. Thicker timber has been used to construct hibernation boxes. In Germany and the Netherlands, bats prefer boxes made from cement and sawdust. Welsh bat workers have recently erected bat houses that provide a variety of roosting opportunities for crevice-seeking bats, such as common pipistrelles (*Pipistrellus pipistrellus*), and those that prefer roof apexes, such as the brown long-eared bat (*Plecotus auritus*).

Instead of trying to get rid of bats in their attics or other spaces, many home owners frequently ask bat workers how they can attract bats to their house. To accommodate bats, special roofing tiles and clay bricks that facilitate the entry of bats to roof spaces are now marketed in the U.K..

In addition to these practical measures to improve the environment for bats, much can be achieved by political campaigning and lobbying. A concerted campaign was successfully mounted in the U.K. over the past decade to persuade industries involved in remedial timber treatments to use pesticides harmless to bats. This was assisted by legal prosecutions, under the Wildlife and Countryside Act, against operators whose activities had resulted in the death of bats.

Because of this campaign, pyrethroid insecticides with low mammalian toxicity now replace chlorinated hydrocarbons for use on roof timbers in bat roosts. In addition, workers in the building and roofing trades likely to come into contact with bats are targeted to improve their knowledge and awareness of bats. One timber company is now an active sponsor of bat conservation, and one mortgage company welcomes borrowers who share their houses with bats.

One incident, which began with the potential for a major setback, turned into something positive. In 1985 rabies was discovered in a serotine bat in Denmark, and a bat biologist in Finland died from a rabies-like virus. Bat conservationists throughout Europe feared that adverse publicity would turn the clock back on what had been achieved. Surveys showed that the virus was sparsely but widely distributed in Europe, and the serotine bat was the species most often infected. Through a low-key approach, bat biologists persuaded those Danes who shared their houses with colonies of serotines carrying the virus to have their dogs vaccinated and to keep their bats. This was a great achievement for Danish biologists and will, we hope, be a paradigm for the future.

A major recent achievement in European eco-politics has been the European Bats Agreement. Part of the function of the Bonn Convention on Migratory Species of Wild Animals is to develop agreements on the conservation of migratory species that would benefit from international cooperation and management. Bats are obvious candidates. The British government sponsored the Bats Agreement, one of the fundamental obligations of which is to promote the conservation of bats and public awareness about their importance.

The Agreement was signed at a ceremony in the U.K. Foreign Office in December 1991 and is now in the process of being ratified. European conservationists are working toward its implementation.

Although much has been achieved in bat conservation in Europe, there is no room for complacency. We are losing bat species worldwide at the same rate that we are discovering them. The most recent addition to the U.K. mammal fauna was a bat--Brandt's bat (*M. brandti)*, identified in the south of England in 1971. The most recent extinction was the mouse-eared bat *(Myotis myotis*), which was no longer present during last winter's surveys of its hibernacula. We have much to learn from the achievements of BCI and look forward to closer cooperation between bat conservationists worldwide.

[bio]
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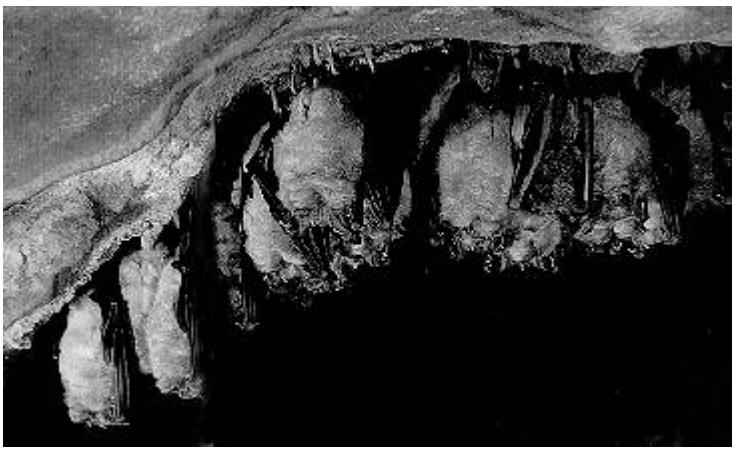
[footnote 1]
* Bat house success in the United States has been much higher. A full report will appear in the Spring 1993 **BATS**.



Throughout Europe, human activities are a major factor in the loss of bat populations. Greater horseshoe bats have declined precipitously in recent years--more than 98 percent may have been lost in the United Kingdom.

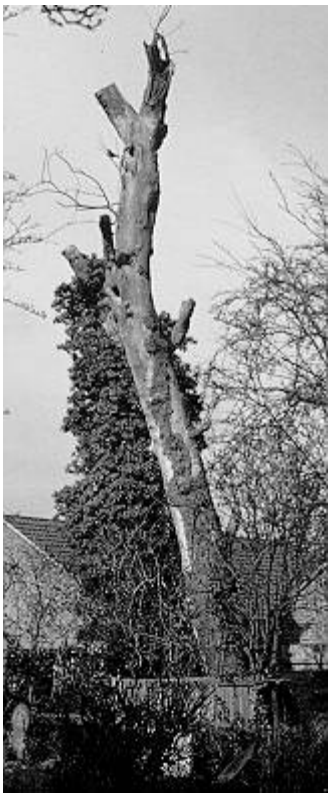
The attics of old houses in Europe (above) have long provided significant roosting habitat for bats as their natural roosts disappeared. But in recent years, remedial wood treatments with lethal insecticides and fungicides (below) have caused the death of large numbers of bats and made their former roosts uninhabitable.

Fossil records indicate that Bechstein's bat was once abundant, but today it is very rare throughout its range. Loss of forests, where it feeds, is thought to be a significant cause of

its decline.

Although human activities have caused the loss of natural bat roosts, they sometimes also provide alternatives. The Greywell Tunnel, built in 1794, is one of the most important hibernation sites in all Britain for Myotis bats.

The lesser horseshoe bat (Rhinolophus hipposideros) rapidly declined in the 1950s and '60s and in large areas of its range is now locally extinct. They hibernate in caves, mines, and cellars, where they are subject to disturbance.



The Bat Groups of Britain have been highly successful in raising awareness of the plight of bats. When this tree, which is used by a noctule (Nyctalus noctula) maternity colony, was threatened by nearby development, a local bat group purchased it. Today St. Paul's Tree is Britain's smallest nature reserve.

All articles in this issue: