

## The Coolest Snake: *Vipera berus* The Common Adder

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It is midday in late February or early March, somewhere in Great Britain. After a long winter, the feeble rays of sunshine of the first warmer days of the year push temperatures up to the vicinity of 46°F. The field naturalist still needs his winter clothes. Hands get cold on the camera lens or the binoculars. Not a hope of finding any active reptiles on a day like this, right? Wrong!

On a patch of dead bracken, on a south-facing slope, lies a snake, stretched out and flattened as thin as a ribbon, exposing the maximum possible body surface to the warming rays of the early spring sun. Its 20-inch body is gray with a dark wavy band extending from the nape to the tail. It is a male Common Adder, *Vipera berus*, the most widespread and most northerly snake on Earth, on its first foray away from the hibernaculum in which it spent the winter.

Over the coming weeks, the same scene will be repeated across Europe and the vastness of Asia, from the Atlantic coast of France to the Pacific coast of Russia, and from the arctic tundras of Scandinavia to the mountains of the Balkans.

The Adder is without doubt one of the truly remarkable snakes of this world. No other snake has a range as vast as this species. *Vipera berus* occurs throughout north-

*Vipera berus* basking on coastal cliff.



Above-- This small viper from the Caucasus—*Vipera kaznakovi*--used to be regarded as a subspecies of *Vipera berus*, but is now generally recognized as a different species; the same applies to *V. seoanei*, an adder-like snake from northwestern Spain and northern Portugal. Right--Female Adder from Berkshire, England. Note the enlarged scales on top of the head which help to distinguish this species from other European vipers. The pattern on top of the head is unique for every specimen and can be used for field identification of individuals.

em and central Europe, being absent only from warmer, low-lying regions. In the north, it occurs considerably north of the Arctic Circle in Sweden, Finland, and Russia. To the east, its range extends across Russia to northeastern China and North Korea and terminates only on the Russian island of Sakhalin in the Pacific Ocean, 6,700 miles, 150° longitude, and 11 time zones east of its most westerly populations. Its habitats range from lowland heaths to forest clearings, railway embankments, coastal cliffs, moorlands, meadows, and alpine regions above the treeline up to elevations of 10,000 feet.

Despite this huge range, only three subspecies are recognized: *V. b. bosniensis*, from the Balkans; *V. b. sachalinensis*, from Sakhalin Island; and *V. b. berus*, from the rest of the range. Certain viper populations from the Iberian Peninsula and the Caucasus were

formerly regarded as subspecies of *V. berus*, but are now treated as separate species (*V. seoanei* and *V. kaznakovi*, respectively).

Externally, there is little to betray the extraordinary nature of *Vipera berus*. The Adder greatly resembles many other small European Vipers. Most adults measure 18"–24" and only exceptionally exceed 32". The coloration is extremely variable. As a rule, males tend to be grayish or yellowish with a strongly contrasting dark wavy line or zigzag running along the entire body. Females are brown or reddish brown with a darker brown zigzag. However, black (melanistic) specimens are common in some populations, and uniformly red individuals are also found. The iris is copper-colored and the pupil is vertical, as would be expected in a viperid. However, unlike in most vipers, the head is not strongly triangular and is not strongly set

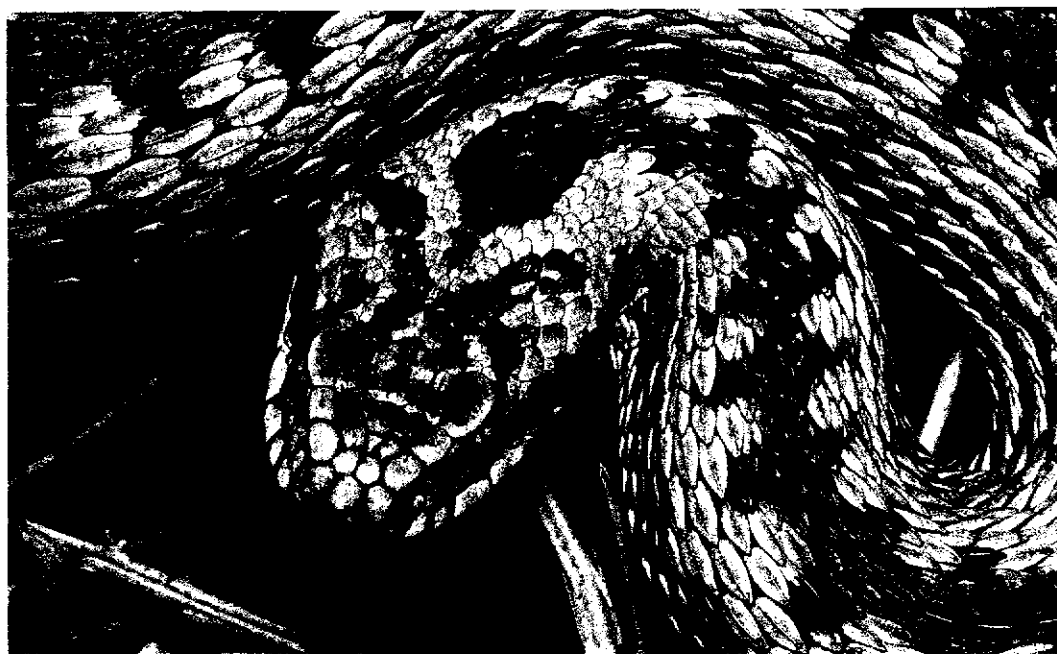
off from the body, which is short rather than particularly stout.

As the first Adders emerge from their hibernacula, a peculiarity of their annual cycle quickly becomes noticeable: all the early risers are males. This early period of basking is necessary for the production of sperm. The first females will only emerge about two weeks after the males. During these early weeks of spring, the snakes will spend most of their time simply lying passively in the open, in full view. Often several specimens can be seen side-by-side or intertwined near communal hibernacula. The high latitudes at which these snakes occur require them to make the most of the little available sunlight and warmth. This explains the sight of large numbers of snakes lying exposed in the open on cool, partly cloudy days. At high altitudes, where solar radiation is strong despite low temperatures, the snake can be observed basking next to patches of snow; they have even been observed crossing the snow on their way to a basking site.

After three to five weeks of basking, the males shed their skins and emerge in particularly resplendent new colors; many speci-

mens are almost white with extremely strongly contrasting black zigzag bands. The mating season has begun. Whereas the males were generally rather passive before shedding, they are now exceptionally restless and crawl around on the search for females. Competition is severe: female Adders only reproduce every other year, and only every three years at high latitudes, whereas males reproduce every year. Consequently, there are far more reproductive males than females in a population. When two or more males converge on one female, spectacular combat rituals ensue, similar to those seen in many rattlesnakes. However, they do not bite each other and the loser is allowed to escape unharmed.

Interestingly, male Adders are smaller than females, an unusual situation in snakes with male combat. It is thought that, in general, stronger, larger males are more likely to win fights and therefore there is increased selection pressure for greater male size. Recent research in Sweden has shed light on the reason for this reversed sexual dimorphism in the Adder: although smaller males are at a disadvantage in a combat situation, they still have a good chance of getting to



mate. On the other hand, in females reproduction carries a high risk of death during the subsequent winter; consequently, there is selective pressure on females to delay reproduction until a larger body size is reached so that the crucial first, and quite possibly last, litter is as large as possible (Madsen & Shine, *Evolution* 48: 1389–1397, 1994).

It is only after the end of the mating season that males and reproducing females start to feed. Nonreproductive females and immature individuals generally start feeding at the beginning of the reproductive season. In many habitats, the snakes scatter over distances of over a mile from their hibernacula. Whereas the hibernacula are generally situated in dry situations (e.g., on south-facing slopes), the feeding areas often consist of damper areas, such as meadows and moors. The diet of adult Adders consists mostly of small rodents but lizards, nestling birds, and frogs are also taken (the latter especially in moist areas). Juveniles feed mostly on young lizards and frogs. During this time, in early summer, Adders are relatively difficult to observe. Unlike practically any other snake, Adders are able to digest prey at temperatures as low as 50°F, an essential adaptation for an animal living at high latitudes or in damp, cool climates such as northwestern Europe.

Gravid females stop feeding in midsummer and often return to the vicinity of the hibernacula. In late summer, many gravid females can be observed near the hibernacula in late summer or early fall. Like most viperids, the Adder is ovoviviparous; the 5 to 20 neonates measure approximately eight inches and strongly resemble the adults in color and pattern.

Nonreproductive females and males return to their hibernacula in late summer or early fall and may be observed basking during the last few warm days of fall, until temperatures drop below 50°–54°F. This may be after as little as three to four months of activity in the extreme northern parts of the range of the species.

Due to its well-defined annual cycle and

its relative observability, the Adder has become one of the most intensively studied and best-known snakes in the world. Whereas most snakes are too secretive to allow direct observation of many facets of their natural histories in the wild, the Adder's lifestyle has made it into a favorite model organism for many ecological and behavioral researchers. It has become widely used for the testing of hypotheses concerning a variety of phenomena, including reproductive strategies, sexual selection, the consequences of pattern polymorphism, thermoregulation, and more. The results have been of importance for the field of evolutionary ecology as a whole and not just for herpetology. Unlike lizards, few snakes are observable enough to have this potential.

Despite its ability to survive in many different habitats, the Adder has experienced a considerable population decline in recent decades. As in many other species, habitat destruction has been the main culprit, but direct persecution through the ages has also contributed to local extermination. A more insidious threat is posed by the fragmentation of the European landscape: nowadays most Adder populations occur as isolates of a few dozen individuals at most, separated by miles of inhospitable farmland or asphalt. Inbreeding is a major threat to the long-term future of such populations. Recent studies in Sweden have demonstrated that prolonged isolation of small populations leads to reduced fecundity and increased offspring inviability (Madsen *et al.*, *Biol. Cons.* 75: 113–118, 1996).

A further problem is that of excessive disturbance. Adders rely on prolonged periods of exposure in the open for the maturation of their reproductive cells, their embryos, mating, and digestion. Frequent disturbance is likely to disrupt these activities and result in low fecundity, poor growth, and increased mortality. As more and more Europeans turn to the ever-diminishing patches of countryside for relaxation, hiking, and letting their dogs run loose, levels of disturbance are likely to increase. Many populations may not

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be able to survive and reproduce under these conditions. The longterm outlook for many populations of this species in parts of Europe, therefore, looks bleak.


On the bright side, the direct persecution of the Adder has diminished considerably in recent decades and it is now legally protected (to a greater or lesser extent) in many countries. This is partly due to more people becoming aware of the fact that this snake does not pose a serious public health hazard, although it is of course venomous.

The venom of the Common Adder is quite potent (more so than that of most rattlesnakes), but the quantities secreted are small. Most human bites are not life-threatening. Less than 25% of bites are severe and with modern antivenin treatment for serious cases, the risk of dying from an Adder bite is almost zero. In Great Britain, 50-100 persons are bitten by Common Adders every year. The last recorded fatality occurred in 1975. In other European countries, case fatality rates also appear to lie between 0.1%-1.0%. Envenomation by European Adders results

in swelling and pain (although the bite may initially remain painless). Fortunately, necrosis or other permanent damage to local tissues is unusual. In more serious cases, systemic effects include reduced blood pressure or even shock, and gastrointestinal disturbances. Both may arise with alarming rapidity after a bite. As in all venomous snakes, a substantial portion of bites result in negligible or no envenomation. Any Adder bite must be regarded as potentially life-threatening, and hospital care must be sought immediately.

The Adder is an adaptable and interesting snake. However, one habitat that it is poorly adapted for is the herpetoculturist's vivarium. Despite many attempts, the captive husbandry of this species is rarely successful and many specimens refuse all food. *Vipera berus* requires strong temperature differences between daytime and nighttime, and sufficient levels of moisture. Because of its very specific requirements and the danger posed by any venomous snake, this is definitely not a snake for the beginner. 🐍

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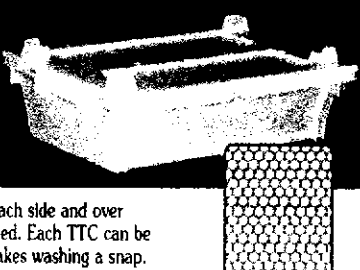
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