

European black slug

(*Arion ater*)

Most conspicuous on wet days, the black slug is an important, but often overlooked, part of the woodland floor fauna in the Caledonian Forest.

Worldwide distribution

The European black slug is native to western and central Europe, from Scandinavia to Spain and from Ireland to Austria and the Czech Republic. It has been introduced to southeastern Australia and to North America, where it occurs in Newfoundland, southern British Columbia, the Pacific Northwest of the USA and some parts of Alaska.

Distribution in Scotland

This slug is common and widespread throughout Scotland and the rest of the UK. It occurs in most terrestrial habitats, including grasslands, hedgerows and woodlands. Two closely-related species are *Arion rufus* and *Arion lusitanicus*, and they can only be told apart from the black slug by dissection. However those other species are restricted to the south of the UK, so *Arion ater* is easy to identify in Scotland.

Physical characteristics and behaviour

The European black slug is an invertebrate (ie an animal without a backbone) and is classified as a mollusc, the group of mainly marine organisms that includes whelks, mussels and squid. It is a gastropod, the class of molluscs that includes snails and slugs, and is defined by the presence of an unsegmented soft body, a large foot and a well-developed head.

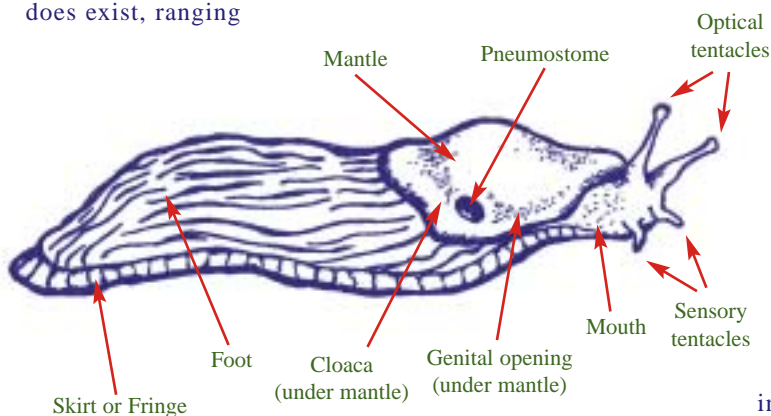
Being boneless, the slug's body is highly flexible and when fully extended it can be up to 20 cm. in length, although 10 - 15 cm. is more normal. As its common name suggests, it is usually black in colour, although considerable variation does exist, ranging



from chestnut brown and orange to pale grey or cream. In general, slugs in northern England and Scotland are jet black, while in the south of England the orange forms appear to be more common – the colour variation is thought to be due to differences in ambient temperatures.



Black slug on the trunk of a birch tree, with its body fully extended and its optical tentacles visible



The slug has a number of prominent features on its body, including two sets of tentacles on its head. The larger, upper set are optical tentacles that are sensitive to light, but they cannot differentiate colours. The smaller, lower tentacles are used for smell and both sets can be retracted when the slug is disturbed or danger threatens. Below the tentacles, the mouth is on the underside of the head, and it contains a toothed tongue known as a radula, that has up to 27,000 teeth on it. The radula is used to rasp food into the slug's mouth.

Behind the head, the smooth area is called the mantle, and it contains a breathing hole on the right hand side known as a pneumostome. The slug actually breathes through its body, but air entering the pneumostome passes into a small lung-like cavity which provides extra skin area

for breathing when the animal is engaged in strenuous exercise, such as moving. The mantle also covers the cloaca, the small chamber from which wastes are discharged, and the genital opening.

Behind the mantle, the back of the slug is characterised by longitudinal ridges called tubercles and this part forms the foot, which is used for locomotion. The edge of the foot has a fringe or skirt, where it meets the sole. The slug moves by flexing and contracting sets of muscle fibres on its sole in waves from the back to the front, which enables it to glide over a surface. Movement is aided by the colourless mucus or slime which the slug secretes. The slime coats leaves and other debris on the ground, thereby facilitating easier movement over them, and the resultant slime trail that is left behind shows the route the slug has taken.

Slime serves several other functions, including keeping the slug's skin moist, which is important in enabling it to breathe properly. It provides some protection from predators, as more slime is produced when the slug is threatened, and it has an unpleasant taste and texture. Slime plays a role in mating, as the slug secretes a chemical in it which attracts potential mates that can follow the slime trail to meet the chemical's producer. A slug will also follow an old slime trail to find food.

When it senses danger the black slug retracts its tentacles and pulls its body back into a compact half-round shape. It also often sways from side to side, although the reason for that behaviour is not entirely clear. Slugs possess the ability to re-grow a tentacle which has been lost, and for *Arion ater* this process of regeneration takes 1 - 2 months to be completed.

The black slug is omnivorous, and its diet includes fungi, carrion, earthworms, leaves, stems, dead plant material and dung. Recent research has also shown that it eats seedlings of Scots pine (*Pinus sylvestris*). The food is



Black slugs mating on the forest floor in Glen Affric. The pneumostome is visible on the slug on the left, and the white gelatinous mass in the middle is the exchange of sperm taking place. that each individual has both male and female sex organs.

However, two partners are still necessary for the exchange of sperm that is needed for reproduction to be successful. When two slugs meet, they circle around each other and push their genitalia out from their mantles. When the genitalia make contact, sperm is exchanged and each partner then goes on to produce fertile eggs. The eggs are laid, often under a log, a few weeks after mating, in a cluster of up to 150, with each measuring 4 x 5 mm. in size. Hatching time depends on the temperature, but can be 4 - 6 weeks later, and the young slugs are 10 mm long and yellowish grey in colour, with a darker grey head. It takes up to a year for the young to reach maturity, and the adults have a lifespan of about two years.

Ecological relationships of the European black slug

The black slug plays an important role in a natural ecosystem such as the Caledonian Forest. By processing decaying plant and fecal material, it helps to recycle the organic matter and nutrients back into a form that can be used by other organisms. This also aids in the maintenance of soil fertility.

Seeds and spores are dispersed by slugs, as they get caught in the mucus or slime as a slug moves and are transported for varying distances before being deposited in new sites when the accumulated debris falls off the animal.

Like most organisms, the black slug has its own suite of predators and parasites, so that it too forms food for other species within the ecosystem. Predators which will eat it in the Caledonian Forest include the badger (*Meles meles*), fox (*Vulpes vulpes*), hedgehog (*Erinaceus europaeus*), slow worm (*Anguis fragilis*) and various birds. A parasitic nematode, French heartworm (*Angiostrongylus vasorum*), which affects dogs, has been reported as naturally occurring in the black slug in France, while a parasitic mite (*Riccardoella oudemansi*) also affects *Arion ater*. Another nematode (*Phasmarhabditis hermaphrodita*) is also a parasite of slugs, including *Arion ater*. It causes a swelling of the mantle, leading to the death of the infected slug within 21 days, and it has recently been marketed commercially as a biological control for slugs in the UK.

Elsewhere in its range in Britain, the black slug is considered to be a pest, especially by gardeners, but in the Caledonian Forest it is a vital, though often



Black slug eating a fly agaric mushroom (*Amanita muscaria*) in Glen Affric. Note the semi-retracted tentacles and the compact shape.

shredded into tiny pieces by the radula and is then digested by enzymes. Because of its dependence on staying moist, the black slug is most active at night and on wet days, when numbers in the forest can be prolific. By contrast, none will be visible on a dry sunny day, when they will rest out of sight, to conserve moisture. Similarly, they will stay deep in the soil on cold days, only becoming active when the temperature exceeds 5 degrees Celsius.