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A third group, (the worm leeches or Pharyngobdellida) have no jaws or teeth and swallow the prey whole. Its food consists of small invertebrates – not humans, thanks heaven!

Leeches breathe through their body wall, whereby aquatic leeches move to the surface when in water with a low oxygen levels. The body surface also contains a number of sensory organs, and together with those on the head they can detect changes in light intensity, temperature, and vibration. Leeches are also equipped with chemical receptors on their head to provide them with a sense of smell. Plus, they have eyes, sometimes only one pair but often several pairs.

As if all the above would not be sufficiently extravagant leeches are hermaphrodites and thus have both male and female sex organs. Their love act is short and probably not very exciting but surely gives the slogan 'equality of the sexes' a true-to-the-letter definition: when mating, two leeches intertwine and each deposits sperm in the other's clitellar area. Rhynchobdellids have no penis but produce sharp packages of sperm which are forced through the body wall of the clitellar area. Once inside the body the sperms make their way to the ovaries where fertilisation takes place, following which the clitellum secretes a tough gelatinous cocoon rich in nutrients into which the eggs are deposited. The leech then shrugs itself free of this cocoon, sealing it in the process. Such cocoons can be buried or attached to the surrounding vegetation. The young leeches – miniature versions of their parents – emerge after several weeks to months, obviously very hungry for blood. They will start looking for a suitable prey (yes, that might be us trekking through the rainforest) and in a cycle of feeding and fasting grow to adulthood. There might be several weeks, or even months between meals, and leeches are able to withstand long periods of draught where they literally dry up. But a couple of drops of water are sufficient to awaken them to continue the cycle until they reach maturity, mate and produce the next generation. Leeches mate only once or twice during their life and then die.

While all the above makes them truly alien beings, it is the feeding you are probably interested in, because that is with which we are normally confronted: most leeches are sanguivorous, meaning that they feed as blood sucking parasites. Most have their preferred hosts but if they are not available they will look for other sources of blood. Land leeches in the Borneo rainforest can be found on bearded pigs, deer, mice and rats, squirrels or any other warm-blooded creature – we humans are not necessarily their preferred host but if we happen to walk right into the way of a hungry leech...

Some species of leeches also feed on fish, frogs, turtles or birds. And some leeches will even take a meal from other sanguivorous leeches, killing it in the process.

Since leeches can ingest several times their own weight in blood at one meal they can blow up to impressive size. An average sized leech here of roughly 3cm long may become as big as your thumb when fully gorged. After the feeding the leech releases its grip, falls off and retires to a dark spot to digest its meal. Digestion is slow, enabling the leech to survive during its sometimes very long fasting periods of up to several months.

It is a myth that leeches climb trees and wait in ambush on branches overhanging trails, waiting for some suitable prey to come by and then letting themselves drop. But hungry leeches are very responsive to light and mechanical stimuli. They tend to sit along or on trails (wildlife trails and trekking trails alike) or in narrow vegetation. They may change their position frequently and explore the surroundings by head movement and body waving. They also assume an "alert posture": they extend their body to full length and remain rigid. Researchers think that this optimises the functions of the sensory organs in the skin.

When a host approaches the leeches 'get excited' and start moving towards the disturbance registered by their various sensors in their typical movement: they extend the body to full length, attach themselves by the anterior sucker and pull the rear up to the head into the so-called 'loop position', attach themselves by the hind sucker, release the head grip and extend again to full body length, attach their front suckers, pull up the rear again and so on. If they do this on you, the best moment to flick them away without having to use any force is during the 'loop position'. At that moment they are not yet properly attached with their hind sucker, but the front sucker is already letting go in preparation of the forward movement. Thus you can



simply flick them away into the jungle, with a snap of a finger.

Moving leeches seem to move very determinedly but they actually move on a trial-and-error basis. If we happen to step very close to a leech it can more or less accidentally attach itself, and that is how they get most of their meals. If the leech has to move towards the host until the anterior sucker makes contact its chances of a meal are slim. This is the reason why, when trekking, the first two or three in the group get proportionally less leeches than those at the rear of the group. The first trekkers alert the leeches as to where about the prey is. They move towards the perceived disturbance and with any luck manage to get a ride on the last few in the group.

When a jawed leech has found a host and identified a suitable area for its meal it attaches itself firmly by both ends and gets rigid to keep in place. With its semi-circular and many toothed jaws (like tiny saws) it makes an incision in the skin and excretes a mucous from its nephropores (external openings from the kidney-like organs). This helps the sucker to adhere even better. A salivary secretion containing the anticoagulant and a histamine floods the wound and the leech relaxes its body to allow the blood to be ingested. This anticoagulant mixture allows the blood to flow and prevents clotting once inside the leech. A bacterium in the gut of the leech assists the digestion of the blood, and it has been shown that the type of bacterium varies with the type of host on which the leech feeds. The bacterium also prevents growth of other bacteria which may cause the ingested blood to putrefy.

#### Leeches in Medicine

For over 2000 years leeches were applied for many ailments as an adjunct to blood letting. Today there is a real clinical application in that they are of great value to plastic surgeons when venous congestion of skin and muscle flaps is a problem.

Leeches are treated in the same way as blood products and are reused only on the same patient.

Medical use of leeches also includes treatment of black eyes, and hirudin is used in the treatment of inflammation of the middle ear. Hirudin is also being developed for experimental use as a systemic anticoagulant, and may prove useful in invitro blood sampling.

## WHERE TO STAY

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