

What are Riverflies?

Riverflies include the insect groups, mayflies (*Ephemeroptera*), caddisflies (*Trichoptera*) and stoneflies (*Plecoptera*). Riverflies are at the heart of freshwater ecosystems and are a vital link in the aquatic food chain as a food source for fish and birds. They live most of their lives as larvae in freshwater habitats before emerging as adults. They are good indicators of environmental quality as they are sensitive to changes in water quality. More than 280 species of mayflies, caddisflies and stoneflies are present in Britain.

Stoneflies (Plecoptera)



There are 34 species of stonefly in Britain. They occur in a wide range of sizes. Some species are among the largest freshwater invertebrates, with larvae growing to over 30mm.

Stonefly larvae have slightly flattened bodies and six strong, sturdy legs so they can withstand fast running water. Stonefly larvae usually mature within a year, but larger species can take up to three years. Most species live in stony streams and are commonly found in upland regions. A few species occur in southern chalk-streams, while others can be found on the wave lashed, stony shores of upland lakes or in marshes and springs. The February red (*Taeniopteryx nebulosa*) is unusual as it prefers slow-moving, lowland rivers with abundant vegetation.



The winged adults commonly emerge during the hours of darkness and the following morning their dried larval shucks (empty skins) can be found on bankside stones. In flight adult stoneflies are conspicuous due to their four large wings. The largest stoneflies have a wingspan of up to 50mm while the smallest, the needle flies, have a wingspan of barely 20mm. Stoneflies are usually brown but can vary from reddish to yellowish brown and one species, the Yellow sally (*Isoperla grammica*), has yellowish green wings and body.

Caddisflies or Sedges (Trichoptera)



Caddisflies are one of the largest groups of aquatic insects with nearly 200 British species. Caddis are found in a wide range of freshwater habitats from cold, fast-flowing mountain streams to ponds, lakes, canals and ditches.

Their larvae have soft, cylindrical bodies and six strong legs which they use to crawl on sediment or climb amongst vegetation. Caddis larvae fall into two categories; case-building (cased caddis) and free-living (caseless caddis).

Case-building larvae make their homes from a wide variety of materials including small stones, shells and vegetation. For example, the Medium sedge (*Goera pilosa*) use small stones and shells and the Great red sedge (*Phryganea grandis*) use twigs, leaves or small pieces of vegetation. These materials are bound together with silk. Some larvae such as the Grannom (*Brachycentrus subnubilis*) use just silk to create their cases.

Caseless caddis larvae, such as the Grey flag (*Hydropsyche siltalai*), usually build nets of silk in which they live and catch their food. This structure is usually anchored to a stone or plant.

When a cased caddis larva is ready to pupate it seals the entrance of its case and anchors itself down. Caseless caddis construct a shelter from small stones in which to pupate. Once transformed into a pupa it will use its powerful jaws to chew its way out of the cocoon to emerge as an adult.



Adults are moth-like in appearance, but their wings are hairy rather than scaly as in moths. Many species only fly at night or in the evening, when they may be present in great numbers. During the day they can be found resting on bankside vegetation. Some species such as the Welshman's button (*Sericostoma personatum*) commonly fly across the water during the day.

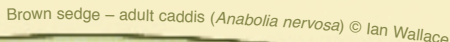
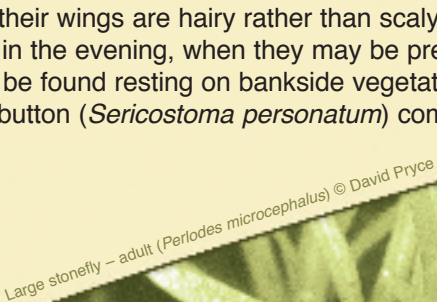
Mayflies or Up-wing flies (Ephemeroptera)

Mayflies are also known as up-wing flies because of their habit of holding their wings vertically above the body. There are 51 species present in Britain. The name 'mayflies' can be misleading as they can appear throughout the year. The name is derived from the habit of one species, the Green drake (*Ephemera danica*), which commonly flies when the Mayflower or Hawthorn is in bloom.



Mayfly larvae occur in most clean, freshwater habitats from stony mountain streams to ponds, lakes and canals. Their larvae can spend up to two years maturing before hatching as an adult fly. The larvae vary in size from the robust, cylindrical larvae of the Green drake (*Ephemera danica*), which can be up to 30mm, to *Caenis rivulorum* which, at just over 5mm, is the smallest British species.

Mayflies are unique among insects in having two stages of winged adult. The larva emerges from the water as a dull coloured dun (sub-imago) that flies up and seeks shelter in bankside vegetation. After a few hours, the dun sheds its skin to transform into the brightly coloured adult (spinner or imago). Adult males form a swarm and females fly into the swarm to mate. The male grabs a passing female with its long front legs and they mate in flight. The male then releases the female and dies. The female returns to the water to lay her eggs then, like the male, also dies.



Rare and threatened species

There is strong evidence that over at least the last few decades there has been a widespread decline in the numbers of riverflies in some British rivers. Eight riverfly species have conservation status assigned by the Government and are listed on the UK Biodiversity Action Plan (BAP).

- Northern February red (*Brachyptera putata*) is a stonefly that occurs only in Britain. It is found mainly in Scottish upland streams.
- Rare medium stonefly (*Isogenus nubecula*) has only been known to occur in the Welsh River Dee and may now be extinct.
- Scarce grey flag (*Hydropsyche bulgaromanorum*) is a large caddisfly only known from stony areas on the River Arun in Sussex.
- Scarce brown sedge (*Isonychia dubia*) is a caddisfly only known from three southern English sites, and there are no recent records for this species.
- Small grey sedge (*Glossosoma intermedium*) is a caddisfly that has been found in only four Lake District streams; however there are no recent records for this species.
- Window-winged caddis (*Hagenella clathrata*) is an orange mottled caddisfly that lives in pools on bogs and heathland at about ten sites in the UK.
- Southern iron blue (*Baetis niger*) is a widespread mayfly species whose abundance appears to have declined in some areas by as much as 80% in recent decades.
- Yellow mayfly (*Potamanthus luteus*) is an attractive, bright yellow mayfly that is found only on the River Wye on the Welsh borders.

Riverflies



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Riverfly Conservation

Riverfly species rely on good quality habitats to sustain healthy populations. The health of a waterbody is dependent on many factors, the primary ones being water and habitat quality. The following pressures should be managed to help conserve riverfly populations.

- **Loss of habitat** Since the 1800's numerous small waterbodies have been destroyed. River drainage and flood protection schemes involving the straightening and widening of watercourses have caused a reduction in habitat diversity, on the banks as well as in the water habitat, and changes in environmental conditions e.g. water depth and temperature.
- **Abstraction** directly from watercourses or via the drawdown of aquifers and reservoirs. Rapid drops in water levels can strand riverfly eggs and larvae. Receding water levels can also lead to dry banks that are more susceptible to erosion and cause damage to emergent and submerged vegetation. Repeated water level fluctuations can lead to compaction of the bed and the loss of habitat for silt-dwelling species. In chalk rivers and streams stretches may become abnormally dry. A reduction in flow may also lead to silt build up, the loss of habitat available to gravel-living larvae, an increase in the concentration of pollutants and a drop in oxygenated water.
- **Nutrient enrichment** resulting from the impact of sewage discharges, agricultural fertiliser, fish farms or livestock can lead to the extensive growth of algae. This can swamp larger aquatic plants which are important to riverfly species. The algae and increased abundance of bacteria can lead to depleted oxygen levels in the water. Nutrient enrichment can be prevented by improved sewage treatment, smart use of fertiliser on agricultural land and the creation of buffer strips.
- **Acidification** can lead to a loss of riverfly species and/or a reduction in their numbers. Some mayflies and caddis species are particularly sensitive to acidification. Acidification is caused by the deposition of sulphur and nitrogen from the atmosphere, sometimes in conjunction with coniferous forests in acid sensitive areas. Despite general recovery over the last 2-3 decades, surges of acidity during storms or snowmelt remain an issue. Changes in land management can help.
- **Toxic chemicals** even in small amounts, can seriously damage riverfly populations. There have been several recent incidents when riverflies have been wiped out from many miles of river by chemical pollutants. In addition to industrial chemicals and agricultural pesticides, many garden and household products contain toxins. Responsible use and disposal of chemicals is critical. Unused or left-over pesticides should always be disposed of using local disposal facilities (see the 'Pesticide disposal directory' details at the end of this leaflet).

The Riverfly Partnership is a network of organisations, representing anglers', conservationists, entomologists, scientists, watercourse managers and relevant authorities, working together to:

- protect the water quality of our rivers;
- further the understanding of riverfly populations;
- and actively conserve riverfly species and habitats.

The Riverfly Partnership Anglers Monitoring Initiative (AMI) enables trained groups to monitor the water quality of their rivers using a simple methodology that complements the strategic monitoring programme of the statutory bodies. Should a fall in water quality be detected, the statutory body is alerted to take responsive action.

- **Loss of marginal, submerged and bankside vegetation** Removal or cutting of marginal, submerged and bankside vegetation reduces the habitat for larval and adult riverflies. Any work that is likely to damage aquatic or bankside vegetation should be carried out only on one bank or one side of the river and preferably on only short stretches.
- **Overgrazing of the bankside** by livestock reduces habitat diversity and can lead to erosion. The silt resulting from erosion can smother gravel on the stream-bed, an important habitat to some riverfly species. Ideally only low to moderate levels of livestock should have access to watercourses and buffer strips of uncultivated vegetation should be used to stabilise the bank. These areas also help reduce pollutants and silt entering the watercourse and provide refuges for adult riverflies. For more information see the booklet "Understanding Buffer Strips".
- **Waterway maintenance and engineering** including dredging, bank protection and weed control, can potentially lead to riverbed disturbance and habitat loss if not managed properly.
- **Loss of woody debris in rivers** Woody debris, including large and small branches, large limbs, root boles or entire trees that have fallen into rivers, is a very important watercourse habitat. It provides riverflies with refuge and egg laying areas, and where it protrudes out of the water it helps riverflies to emerge from larvae to adults. Woody debris should be left in a watercourse and encouraged to accumulate naturally, unless there is a well-supported case for its removal or repositioning. For information see the booklet "Managing Woody Debris in Rivers, Streams & Floodplains".
- **Light pollution** The steady increase in the intensity and distribution of lights next to rivers may have a negative impact on riverfly populations. The adults of many species, particularly caddisflies, are attracted to light and bankside lights may lure them away from their natural waterside habitat.
- **Invasive species** are non-native species that cause environmental damage. A number of invasive species are present in freshwater systems, for example the Killer shrimp (*Dikerogammarus villosus*) and the Signal crayfish (*Pacifastacus leniusculus*). These species can significantly alter the habitat and once established they are difficult to control, and so prevention of their spread is critical. For more information see the Non-native Species Secretariat website.

Further information

Environment Agency (1996) Understanding buffer strips. An Information Booklet.

Field Studies Council publications on riverflies www.field-studies-council.org

Kirby, P. (2001) Habitat Management for Invertebrates: A Practical Handbook. RSPB

Macadam, C. (2003) Ephemeroptera and Plecoptera - Mayflies and Stoneflies. Managing Priority Habitats for Invertebrates. Volume 7. Buglife - The Invertebrate Conservation Trust

Mott, N. (2006) Managing Woody Debris in Rivers, Streams & Floodplains. Staffordshire Wildlife Trust, UK

Non-native Species Secretariat www.nonnativespecies.org

Pesticide Disposal Directory (Pesticide Action Network UK) www.pesticidesdisposal.org

Riverfly Partnership www.riverflies.org

RSPB, NRA and RSNC (1984) The New Rivers and Wildlife Handbook. RSPB Publications

The Association of Rivers Trusts: Habitat techniques manual, information sheets, training and advisory support. www.associationofriverstrusts.org.uk

Wallace, I. (2003) Trichoptera - Caddisflies. Managing Priority Habitats for Invertebrates. Buglife - The Invertebrate Conservation Trust

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