

Australian Insects

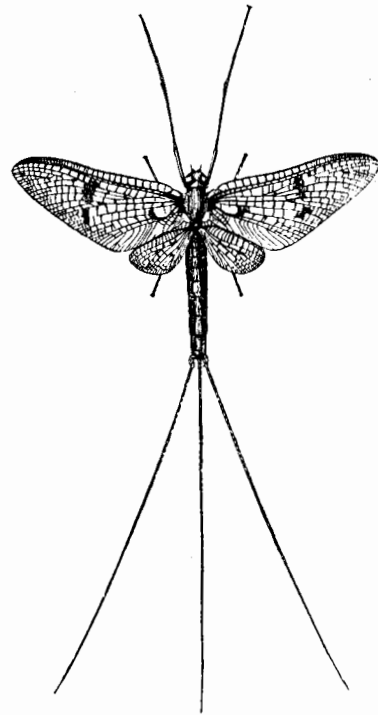
IV. The May-flies

By KEITH C. McKEOWN

THE insects of the order Ephemeroidea (or Plectoptera) are popularly called May-flies, and have a wide distribution throughout the world. Australia in comparison with other lands is not rich in these insects, for, while about 500 species are known from the world, some twenty only have as yet been described from our continent. To the average observer these delightful little insects are largely unfamiliar, and, apart from the angler and those especially interested in the life of our streams, few pay them more than casual attention, yet they are remarkably interesting little creatures, and their life-histories present many curious features.

The association of their name with the Ephemeroidea of Greek mythology applies only to the very brief period of adult life of these insects which is spent above water and which lasts but a few hours, or at most a few days. By far the greater portion of their existence is spent wholly submerged in the running water of rivers and streams, although the nymphs of some species may emerge from the water and cling to the wet rocks under and around waterfalls. The life of the nymph is considerably prolonged, and may occupy, possibly, up to as much as three years.

The eggs are deposited in masses, in a somewhat haphazard manner, in running water, but soon disintegrate and become scattered in the mud or among the water-weeds. In a number of species each individual egg is provided at the ends with a skein of fine yellow threads, which become unravelled and serve to anchor the egg to plant stems or other submerged objects. After about ten days, or even several months, these eggs hatch, and produce small and active nymphs.

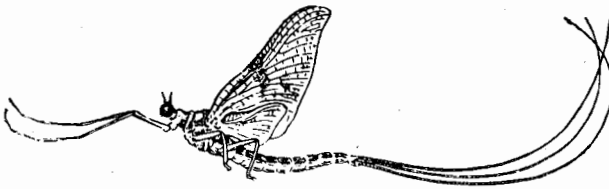


A typical May-fly.

After British Museum.

These newly hatched nymphs are curious, rather emaciated-looking little creatures, which hasten to seek shelter under stones or in crevices in the banks of streams; others again burrow directly into the mud of the stream bed.

Their food is simple, for they are vegetarians, feeding upon algae, the tissues of higher plants, or even upon decaying vegetable matter accumulating at the bottom of pools. Some forms have been accused of carnivorous tendencies,



Male May-fly showing the elongated forelegs, and the manner in which the wings are carried while at rest.
After Comstock.

but there is as yet little evidence available to confirm or refute this suggestion with any degree of certainty. With plentiful food the nymphs grow rapidly, and, with increasing bulk, cast their skins frequently. No definite information is available regarding this aspect of the lives of our Australian species, and even with the more fully investigated European species the information is still incomplete. Sir John Lubbock recorded twenty-three moults in *Chlocon dipterum*, but his observations did not commence with the earliest stages.

The fully grown nymph is a drab creature, giving no indication of the fragile beauty of the perfect insect into which it will develop. It is soft and delicate, elongated and slender, with a head that seems disproportionately large for its body; the abdominal segments are fringed with overlapping leaf-like gills by means of which the oxygen necessary for life is extracted from the water that bathes its body. Three slender filaments, margined with fine hairs, project from the extremity of the body. In the well-developed nymph wing-pads are prominent, but in the younger forms these pads are wanting or very small; they are developed during the successive moults, usually appearing when the insect is about half-grown.

When the nymph is fully developed it swims to the surface of the water or climbs up the stem of some convenient aquatic plant which projects above the water. During this journey many fall a prey to voracious fish, which gulp them down in enormous quantities. Once at the surface the insect behaves in a really remarkable manner; it gulps air into its

body until the alimentary canal is greatly distended with it, and this condition is retained in the perfect insect. This renders it lighter and so adds to its powers of flight, and also makes it extremely buoyant when the critical time arrives for it to deposit its eggs. This lowering of the insect's specific gravity is accomplished only by the sacrifice of its power of feeding—the adult May-fly never takes food.

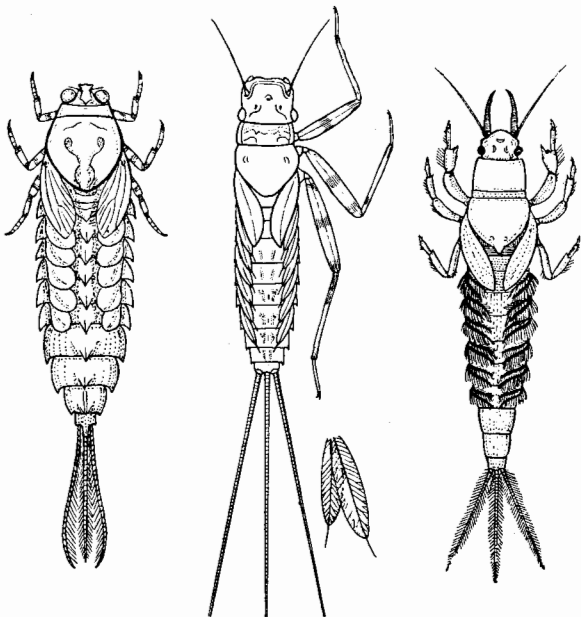
But to return to the emergence of our May-fly. With something of a struggle the nymph forces its way through the surface film and floats high and dry upon it. Its nymphal skin splits, and the enclosed insect wriggles rapidly from its rent husk and flies away, leaving the empty skin floating on the water until wind and waves swamp the frail vessel. When we consider the length of time necessary for other insects to dry and harden their wings after their emergence from the pupal or nymphal skin, the rapidity with which the newly emerged May-fly takes flight is truly amazing. Sir John Lubbock has written: "From the moment when the skin first cracks not ten seconds are over before the perfect insect has flown away."

The story is, however, not yet told. The insect has yet another surprise in store for us. The May-fly that has emerged from the nymphal skin and rests upon some rock or tree-trunk has the wings dull and frequently clouded or blotched; it is not yet mature. It is encased in another skin which must be cast before it is fully adult—a skin that not only covers the body, but completely encloses the wings as well. In this state it is termed the "sub-imago". This next stage

of the transformation may occur within a few minutes of emergence, or may be deferred for several hours or even for some days. This sub-imaginal skin, finer than the sheerest tissue, splits, and the true adult or imago withdraws its legs and wings from their casing, and flies off, leaving the empty skin, perfect in every detail, clinging to its support. This remarkable condition is unique among the May-flies and does not occur in any other group of insects. The May-fly has now left its days of feeding behind it, and is ready for the dance of love.

The perfect insect is one of the daintiest and most beautiful insects imaginable, so fragile that a touch will crush it. It is large-eyed, and rests with its fore-legs extended straight before it; in the male these limbs are often exceedingly long. The two pairs of clear gauzy wings are held erect over the body, reminding one of the sail of a yacht. The front pair is large and fan-like, the hind small and inconspicuous. The antennae are small, but as though to emphasize their lack, and to complete this delightful little creature, three slender filaments project from the hind extremity of the body.

The swarming, or nuptial flight, of May-flies is a sight to linger in the memory. I have been fortunate enough to witness several of these flights on certain occasions on the Tuross River, New South Wales. With the coming of dusk the adult May-flies, which have been resting upon the rough bark of the trees or concealed in hollows in their trunks, take wing and engage in an erratic flight, which has a curious up and down movement, over the water. The whirling mass of insects consists primarily of males, but the females hover about on the outskirts, and ever and anon these will dash into the thickest of the swarm to be seized by the long forelegs of their mates. These pairs abruptly leave the dance for the seclusion of the overhanging vegetation. Marriage seems to mean death for the males. As the evening progresses, the insects become fewer, and the water of the stream more and more dimpled where the mated females are busy depositing their eggs. In some instances egg-laying may be deferred to an evening or two later. Such flights may occur on several successive evenings, but I believe that seldom or never does an insect survive to attend more than one of these scenes of carnival.



Three types of May-fly nymph. A free-swimming form; a rock-dwelling nymph, with two of the gills enlarged; and a burrowing type. After Tillyard.

One of the best accounts of the swarming of May-flies is one of the earliest, that of Réaumur. After describing the behaviour of insects which he had confined in a bucket, he continues:

So far I had taken no notice of what was going on by the river, but now the exclamations of my gardener, who had gone to the foot of the stairs, attracted my attention. I then saw a sight beyond all expectation. The Ephemerae filled the air like the snow-flakes in a dense snow-storm. The steps were covered to a depth of two, three, or even four inches. A tract of water five or six feet across was completely hidden, and as the floating insects slowly drifted away, others took their place. Several times I was obliged to retreat to the top of the stairs from the annoyance caused by the Ephemerae, which dashed in my face, and got into my eyes, mouth and nose.

It is singular that nocturnal moths, which shun the light of day, should be attracted by the lights in our rooms, and still more singular that these Ephemerae, which emerge only after sundown, and perish before sunrise, should be drawn so powerfully towards a lantern. The person who held the light had a bad time of it; in a few moments he was covered with the flies, which came in all directions as if to overwhelm him. The luminous sphere about the light was crossed at all angles by the orbits of the circling insects, which after performing one or two revolutions fell to the earth.

After half an hour or less the swarms were less dense, and by ten o'clock only a few scattered Ephemerae could be seen on the river, while no more came round the light.

After the nuptial flight egg-laying takes place with little delay, the eggs

being rapidly extruded in two yellowish masses. The May-flies flit quickly over the water, dipping the tip of the abdomen beneath the surface to wash off the adhering eggs; others alight upon the water for this purpose, or even descend beneath the water to lay their eggs upon or under stones. Some float again to the surface, but most of them die without reappearing. It is at such periods that the trout consume them in countless numbers.

The Australian May-flies are divided into four families, the Siphonuridae, Ephemeridae, Leptophlebiidae, and the Baetidae. The Leptophlebiidae is our dominant May-fly family. *Attalophlebia costalis* is the commonest of our May-flies, a rich brown species with extraordinarily long tail filaments. Of the Siphonuridae, members of the genus *Ameletus* occur in Blue Mountain streams, and of *Coloburiscus* on Mt. Kosciusko and in Victoria. Larvae of an undescribed *Ichthybotus* (Ephemeridae) occur in the Fish River, New South Wales. Baetidae are represented by a few small northern forms.

Remarkably little is known as to the details of the lives, or even of the nymphal forms, of our May-flies, and a wide field awaits the observer who devotes himself to their study.