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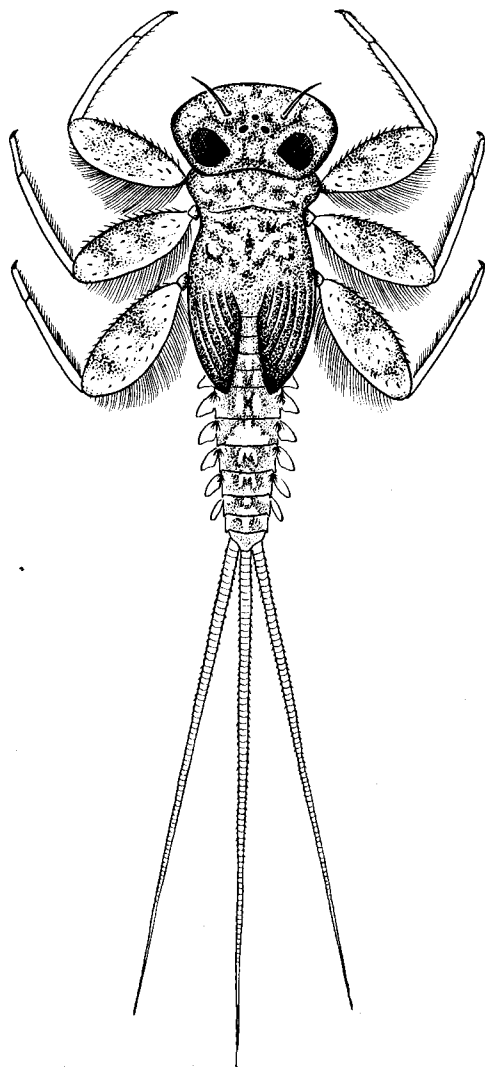
CAPE MAY-FLIES

By A. CECIL HARRISON.

PART V. THE FAMILY ECDYONURIDAE

THE Rev. A. E. Eaton gave the name *Ecdyonurus* to a genus of May-flies in 1868 "in allusion to the abortion of the median caudal seta". He took the March Brown *Ecdyonurus venosus* (of Fabricius, in *Ephemera*, 1775) as the type of the genus. The family Ecdyonuridae was founded by Eaton in 1885 to include *Ecdyonurus* and a number of allied genera from various parts of the world. The genus *Afronurus* was established by J. A. Lestage in 1924 for African representatives.

The aquatic nymphs of the May-flies of this family are adapted for life in rapid water, with disc-shaped heads and all parts of the body flattened out, and they are able to move very rapidly over the surface of stones without being impeded or dislodged by the force of the current.



K. H. Barnard del.

"Tawny Yellow" (*Afronurus harrisoni*, *forma major* and *forma minor*,

Barnard) November to April.

When submerged stones are lifted from the bed of a stream like the Groot Drakenstein Dwarfs or the upper Eerste, scurrying May-fly nymphs may be noted which are rather different in shape from the Leptophlebiids dealt with in the previous parts of these notes. They are very flat, the body and legs being compressed, and the head suggesting the shell of a crab. They vary in colour and markings, but yellow ground-colour is characteristic. Some are pallid yellow, a very common mode is yellow blotched with reddish-brown; in great contrast, another fashion demands fine mottling of dark brown on a duller ground-colour; and some individuals go to the opposite extreme of a uniform dark brown. The gills of these nymphs are arranged along the abdominal segments like those of the Leptophlebiids, but differ in consisting of an outer leaflet covering a bunch of filaments. The antennae of the Tawny Yellow nymphs are very short, contrasting with the long waving feelers of the larger Leptophlebiids.

Even the tiniest nymphs display the distinctive shape and a remarkable swiftness of movement. Recognisable specimens can be found at all times of the year, but the Tawny Yellow does not reach the "hatching" stage until summer. When the

investigations were commenced, some twenty years ago, it was thought that there might be more than one species of this family in the local rivers or, alternatively, that the aquatic life cycle of this May-fly might run for more than a year. This was because so many smaller individuals were present in any locality where the fully-fed nymphs were nearly ready for the midsummer "hatch", but Dr. Barnard found only one local species in all the material collected, and showed that the confusion arose from the fact that it includes *major* and *minor* forms. Many complications arose during the working out of the life history of the Tawny Yellow, which added zest to the hunt, and many things remained unsolved—notably the feeding habits of the nymph, which is suspected to be predatory to some extent on smaller creatures.

The name "tawny-yellow" was applied in the first place to those nymphs which have yellowish ground-colour with tan-coloured markings, before anything was known about the colours of the flying stages. At the same time another very common colour variety was called the "partridge-mottled" nymph, as its whole upper surface and tail-whisks were like the game-bird feather from the rump of the English bird, often used for hackling the March Brown artificial fly. This further complication gave rise to some expectation that we might be harbouring a real "March Brown" coloured species, as well as something else, but it was not so, and when a large number of subimagoes was obtained by "breeding" from collected nymphs, it was found that "Tawny Yellow" fitted them all, no matter whether the nymphs from which they emerged had been "tawny-yellow", "partridge-mottled" or almost self-coloured.

The large form of the Tawny Yellow, which emerges at midsummer, is a very striking insect of about half an inch in body and wing lengths, with two tail whisks of greater length. Its season lasts from about the end of October until the middle of February in the Stellenbosch and Paarl Divisions, with the peak of emergence during the Christmas and New Year holidays.

The body colours of the subimago are very variable, in different combinations of yellowish and reddish-brown. But the most notable variation is in the wing patterns before the final moult, the three prevailing trends in order of frequency being:— (1) wing membrane dull hyaline yellow with brownish veins, (2) wing membrane clouded with brownish, except for the front marginal area which is yellowish, and with bright yellowish veins, (3) as in (2), but with deep brownish veins. But again it was remarkable that subimagoes with all these wing patterns (some in great contrast to others) emerged under observation quite at random from either the "tawny-yellow" or "partridge-mottled" kind of nymph.

Much of the colouration of the wings disappears with the moulting of the subimaginal pellicle, which leaves them clear with only a faint yellowish tinge and veining. The general colouration of the body of the imago is yellowish, darkening with age, with a long dorsal stripe which may vary from burnt sienna to reddish orange or even a more definite red. The female often has a purplish shade on the abdomen. The huge turbinate eyes of the male imago are very beautiful objects, making kaleidoscopic changes as the light catches their many facets—sometimes giving quite a touch of ruby-red to the head. The two long tail whisks are light reddish-brown with sepia rings. Altogether, it would be a most satisfactory insect for the fly-tier to imitate, were it not for the lamentable fact that it is rarely found on the water!

During two years of rather intensive search, Tawny Yellow flies were never found by day on or near the rivers, and only drowned specimens were collected—the first on a tank of weak hydrochloric acid used for the treatment of pears which in those days were sprayed with arsenic against codlin moth! But the streams were teeming with maturing nymphs, although no empty shucks were found on stone. It was not until aquarium experiments were carried out that the answers to the puzzle was obtained—that the Tawny Yellow subimago almost invariably emerged at night, and that the nymph did not crawl out above the water line before the transformation. In fact its inseparability from its beloved

stones below water was maintained right up to the moment of crisis in an amazing way.

The nymphs used in the tank experiments were taken from stones in the Dwars and Eerste Rivers. They are very agile in their movements and prefer to dodge from one surface to another when a stone is turned over or raised from the water, rather than to take to swimming by rather clumsy movements of the body and legs, which is all that they can manage in the way of free progression. Their hold on wet stones is so tenacious that it is hard to dislodge them unharmed into the collecting jars by the usual method of pouring water over them with the lid.

Attempts to rear half-grown nymphs were unsuccessful. They would live for a month or more and undergo a moult before dying, apparently of starvation, but no Tawny Yellow nymph was ever seen to feed on the nutrient ooze which was consumed by the Leptophlebiids in the same tank. There was a strong suspicion that they needed live food, but were not observed to prey on the smaller larvae which were available. The experiments were confined therefore to the breeding-out of flies from fully-fed nymphs.

In no single instance did a Tawny Yellow climb either up to or above the water line before the emergence of the subimago, and the glass sides of the tank and protruding stones, which were used by other species, were ignored. The "hatching" always took place after dark either at the surface-film in the traditional way, or from well below the surface. This being the case, it is easier to account for the complete absence of nymphal shucks from the river-side during the peak of the summer emergence, as the delicate skins would be broken up and carried away before morning or remain submerged as the subimagoes had left them.

The subaqueous method, or "Monte Cristo escape", was extraordinarily interesting to watch, and it may well ensure a higher rate of survival of the crisis than the alternative. The nymph grasps a suitable object, such as a small pebble or handy knob on a stone, about four inches below the surface of the water (i.e. in tanks, but perhaps at greater depth in the river) the skin of the back splits, and the subimago slips out quickly and easily and shoots up to the surface with the wings folded plicately along the abdomen; bursts clean through the surface film from its impetus, resting thereon for only an instant on its legs, and then takes off with great energy without a drop of moisture upon it or any bedragglements. In most cases the empty nymph skins remained under water, firmly attached by the claws in the position selected for the emergence—sometimes on the sides of the larger stones, but never less than an inch below the water surface.

The records kept at the time of the tank experiments show that only 10% of the Tawny Yellow May-flies which transformed by the subaqueous method failed to make a perfect emergence, whereas more than half of the individuals which struggled to hatch at the surface film came to grief. The inference seems to be that underwater "hatching" is the regular practice of the fittest individuals of this species and by far the safest method, as the force of the sudden rise sends the subimago right through the surface film ready for the take-off. Except in a few instances, the nymphs which came up to the surface at the critical time were either weaklings, or had failed to find or take up a firm anchorage before they lost the power of gripping with the claws.

In the cases of a few individuals which did transform successfully at the surface, all the usual stages were noted, viz., restless swimming with rapid gill movements, the sudden stoppage of gill action and the appearance of the escape split, the protrusion of the dorsal part of the thorax with legs and abdomen hanging limply, the "growing longer" and the hoisting of the wings and pause before the take-off—a comparatively lengthy process which would expose the insect to far more danger from predators than the rapid Monte Cristo act direct

from the stream bottom cover. For some time prior to its emergence, the two outer tail whisks of the subimago could be viewed under the nymphal skin, withdrawn from their nymphal sheaths in sinuous coils by the shrinkage of the fly's abdomen—the central whisk being aborted and absent from the adult in this species.

The favourite time for the emergence of the Tawny Yellow was found to be between 8 and 10 p.m., and the insects were so sensitive to light at this stage that the switching on of the electric lamp often had fatal results, as the sudden illumination caused panic and displacement of nymphs in ecdysis from their attachment to stones which they were then past regaining. A good many evenings were spent in trying to surprise the insects at the right moment for the Monte Cristo act, and this interference resulted in the deaths of many.

The Tawny Yellow was found to remain in the subimago stage for 24 to 36 hours after its emergence from the nymph, and some imagoes were kept alive for six days. The large form of this species has its winged season at the warmest time of the year and its period of adult life is somewhat shorter than that of spring and autumn May-flies of similar size. One female, which had lived for four days in the imago stage, extruded an egg mass before dying. The eggs were pale yellow and ovoid, with tough and elastic attachment threads.

"Dwarf Tawny Yellow" (*Afronurus harrisoni*, *forma minor*, Barnard)

When the season for the emergence of the large Tawny Yellow has passed its midsummer peak, by about the beginning of February, it will be found that there are numerous but much smaller nymphs under the same stones, which have dark wing pads and are obviously ready to disclose the subimago in spite of their miniature size. These are a second wave of the same species, *A. harrisoni*, identical to specific characters with the midsummer form but reduced in almost every respect. Collections of fully-fed nymphs were made in February and March, and both the tawny-yellow and partridge-mottled colour varieties were represented. Small male subimagoes had been found earlier, but the peak of the "natching" season of *forma minor* did not occur until March amongst the specimens held in tanks.

Although the Dwarf Tawny Yellow is so much smaller than the large form (average sizes: *forma major*—body, male, 11.5 mm., body, female, 12 mm., wing, male 12 mm., wing, female, 13 mm., cerci, male, 24 mm., cerci, female, 25 mm.; *forma minor*—body, male, 8–9 mm., body, female, 9.5 mm., wing, male, 9 mm., wing, female, 10.5 mm., cerci, male, 13–19 mm., cerci, female, 18 mm.) and its colours and markings are not so elaborate, it is similar in every respect in its habits and apparently also in the duration of its aquatic life period from egg to mature nymph. The last point was not proven, but the winged stages of *forma minor* survived as long in captivity as those of *forma major*—i.e. they did not have the shorter period of adult life which is the general rule with the smaller species of the Leptophlebiids. In the Dwarf subimago, the wing pattern "(2)" was by far the commonest, in fact all those bred-out in captivity had the wings clouded with brownish and with light yellowish patches and veining. Subaqueous emergence of the subimago from the nymph, as described in connection with *forma major*, was found to be the standard practice of all healthy individuals of *forma minor*.

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Another species of this genus, *Afronurus peringueyi* (E.—P.), was described by P. Esben-Petersen in 1913 in the *Annals of the South African Museum*, from adult flies collected in Zululand. There are slight, but quite definite, differences on which it is separated from *harrisoni*. Major and minor forms are also present in *peringueyi*. A nymph from Natal was described by Dr. Barnard and assigned to *peringueyi*; and this was confirmed later by R. S. Crass, who bred-out sub-

magoes in captivity. Crass found both species abundant in Natal, but *peringueyi* less common and more local than *harrisoni*; and he also traced the occurrence of the former as far south as the Amatola Mountains in the eastern Cape Province.

ARTIFICIAL TAWNY YELLOW NYMPHS

Although the winged stages of the Tawny Yellow may be of little use to anglers of the exact-imitation school, the same cannot be said of the nymph.

As it was found from autopsies that Tawny Yellow nymphs were quite a definite item in the diet of trout in the Groot Drakenstein Dwars River at midsummer, the following pattern was tried and used with success (fished on a Farlow "Hewitt" 3x cast):— Hook, No. 10 or 12; body of yellow-dyed seal's fur tied with a hump and tapered, ribbed with a black-red game bantam neck feather and oval gold wire; tail whisks of golden pheasant topping; legs (a skimpy hackle) of golden-brown and grey-mottled snipe feather.

It was particularly useful when stalking nymphing trout in very low water. One brown trout which took it, contained six large Tawny Yellow nymphs amongst a collection of those of smaller May-flies.



Photograph: Colin Kisch.

The "Palmiet Pool", upper Witte River on "Oostenberg" in the mountain valley above the Bain's Kloof road pass. (Breede River system). The upper Witte River is unique in the fact that it contains only brown trout—and no other fish of any kind above the falls in the gorge behind the hotel. The pool shown is famous for its large brown trout, but very few are landed, as they are very shy in the clear water and fine tackle is necessary. Those hooked are usually lost when they run under the palmiet rush clumps in deep water. The fishing rights are held by the Society from the Paarl Municipality, and day tickets can be obtained from the Society's office, or from the Hotel-in-the-Mountains at the crest of Bain's Kloof. The fishing season closes on April 15th on this particular river, as brown trout are advanced in spawn earlier than rainbow trout.