

in the past, and for suggestions for future issues. Many very useful suggestions have been filed for incorporation in future issues as the opportunity arises. We

would point out that if any readers have not written and would still like to, that their suggestions, and constructive criticisms, are always welcome.

Postal Microscopical Society

ONE of our members proposes to circulate a set of slides of bacteria which he has prepared, most of which would require an immersion lens for their proper examination. I am quite aware that some of our members are not interested in high-power work, so therefore I would be glad if those to whom this set does not appeal would kindly inform me by means of a post-card, so that I can omit their names from the way-bills when sending out the set on circuit.

Another member has suggested that when writing the notes describing the slides in the note books, a few pages should be left after the description of each slide so that other members, when adding their comments, could write those relating to any particular slide in the space thus provided, the loose-leaf system allowing for further pages to be added if necessary. In this way all the notes, both original and additional, relating to each slide would be

kept together instead of having the added notes and comments assorted, as it were, at the end of the book. It would be interesting to hear members' opinions of this system; and, of course, anyone is free to adopt it if he chooses.

Owing to the fact that it now takes nearly two years for a box to complete the circuits, several members have requested that their sets be returned to them when about half way through for inspection, overhaul, and to enable any queries in the note book to be answered. I have already asked each member, in one of the note books, to say whether he would like his set returned "half way" or not. Most are in favour of this, and I shall accordingly make it a practice to do so except in the case of those who have expressly stated that they do not wish to have their sets returned until they have travelled all the circuits.

NEW KNOWLEDGE ABOUT MAYFLIES

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ONE of the most remarkable life histories in water life is that of the mayfly which undergoes an extraordinary number of moults through the juvenile aquatic nymph stage to the aerial adult of but a few hours existence, and it probably needs this constant change of structure to

fit in with the constant changes in its environment. Most insects allied to it go through their lives with only five or six moults, but the common *Ephemera similans* undergoes 30 moults and one of the Canadian mayflies (*Stenonema canadense*) passes through between 40 and 45 moults.

Recent studies of the mayflies have added much to our knowledge of these insects, Mr. F. P. Idle in Canada and field workers here being responsible for them. There are some 50 mayflies or Ephemeroptera in Britain of which *Ephemera vulgata* and *E. danica* are the common ones, and *E. lineata* somewhat rarer. There are no less than five species of *Baetis* coming under the angler's name of "Olive Dun," while the term "March Brown" for one of the earliest of the northern hatches covers *Rhithrogena haarupi*, *Ecdyurus longicauda* and *E. venosus*. *Rhithrogena* was discovered in 1931 and confines its hatching to March, the other March Browns or duns prolonging theirs throughout the season. Grouped according to the number of wings (four or two) and tails (two or three) they may be preserved for a study collection if the insect be dipped into a tube of dilute methylated spirits, then transferred to a tube partly filled with water and daily drops of glycerine until the tube is full, finally a drop or two of acetic acid to prevent fungus growth.

Field studies have shown how fatal any tarred roads near water may prove to aquatic insects for after a spring shower, with the tar glistening moist with rain-water; thousands of mayfly lay their eggs on the wet roads, mistaking them for water, and of course the loss is considerable. Sportsmen have paid special attention to the encouragement of mayfly haunts and have thus extended our field knowledge considerably. It has been shown that as much weed as possible should be left near those parts of the river favoured for spawning as well as making judicious use of fly boards. Tree shelter near their river haunts is more important still: sufficient should be planted to cast an afternoon shade but not permanently deprive the pondweeds of

sunshine. Thicket belts of trees not too close to interfere with the fishing, will keep the cold winds off the water for thousands of newly hatched mayfly are killed by the spring night frosts, or are blown away from the water, where they must lay, by the keen spring winds. Where there are no trees nearby the flies must roost the night in the grass, and the May and June ground frosts take wide toll of them. Examination of nearby trees where they exist has shown how many of the adult flies will seek quite high roosting places to escape these night ground frosts. One investigator claims that a belt of trees will thus increase the number of eggs laid tenfold or possibly a thousandfold compared to a water exposed to winds and frosts.

Now let us sort out of this immense group of mayflies some sort of order by which we can recognise our insects. They have ten-jointed bodies with long, bristle tails, but the common notion that they live but a day does not apply to all: some perish before 24 hours are passed and some live several days; nor do they all appear in May for some of the group appear in autumn, some fly only during the cooler sunlight, some only at evening, others at night. The swarming, up and down dances in the air have a preponderance of males, just like the dancing flights of lesser house-flies around the kitchen lampshade. Specimens have been found 6,300 feet high by the glaciers of Mont Blanc, in Europe, America and Asia. One of the earliest known fossil insects was a giant mayfly with a 5 inch wing span, from the Devonian strata of New Brunswick, and more recently a fossil with a 7 inch wing span was described from Nova Scotia by Dr. Dawson of McGill University. Why the mayfly should spend a brief aerial life after an aquatic youth, and yet return again to water: to lay, instead

of spending its whole life in the water, is probably the need for the sunshine to show its brilliant reflections and colours as a necessity in its courtship display, also to obtain fresh breeding grounds when its original water is overstocked.

Eaton, pioneer student of the mayflies, grouped them into ten generations with families of those with 4 wings and 3 tails; 4 wings and 2 tails; 2 wings and 3 tails; 2 wings and 2 tails. Most naturalists know that hatching from the aquatic stage the mayfly has a darker sub-imago stage before moulting into the final adult flying stage. Males are recognised by their very long forelegs and larger eyes. Larva hatch late in May or early in June, having rather long antennae, 3 feathery gill-tails, and long projecting jaws crossed at the tips.

The March Brown (*Rhithrogena haarupi*) is on the wing from late March to May, hatching in unexpected swarms at times. A large, dingy brown fly, it has 2 tails. The male *Ecdyurus longicauda* was formerly confused with the March Brown: it is the bright red fly amongst the evening swarms of late summer, and is the prototype of the Great Red Spinner. The Olive Duns (*Baetis*, sp.) have two tails and hatch in summer, males being pearly grey on the body and spent females (Red Spinners) a russet red body. Three small ones (*Baetis binoculatus*, *B. scambus* and *Centroptilum luteolum*) with yellow, sepia or light red males are called Pale Watery Duns. The Iron Blue Dun (*Baetis pumilus* and *B. niger*) are small, slate-blue winged flies with dirty olive bodies, darkest in the males, the spent female being almost chestnut on the body.

The large pale watery dun, or blue-winged pale watery fly (*Centroptilum pennulatum*) is larger than the other duns, the male having bright orange-

tinted eyes and it is most often found on the Welsh Dee, Kennet and Itchen. All those duns are two-tailed flies. The blue-winged olive (*Ephemerella ignitia*) has 3 tails, long dark-blue wings, a green-red body in the male and olive in the female; the male also has reddish tinted eyes.

The bodies of most female mayflies carrying eggs just before laying are yellower, and spent males and females are like the anglers' "sherry spinner."

The yellow May dun or hawk (*Habrophlebia fusca* and *Heptagenia sulphurea*) appear from May right on to December, and have two tails. The claret dun (*Leoptphlebia vespertina*) has 3 tails and is commonest in Ireland. The turkey brown (*L. submarginata*) looks like a dark brown, plum-coloured March Brown with 3 tails. On still waters may be found *Cloeon* and *Ameletus*, two winged flies with two tails, and often in North Wales *Potamanthus luteus* and *Rhithrogena semicolorata*, greyish-yellow flies like a pale olive dun.

The Green Drake and Black Drake of anglers are the males of the common *Ephemera vulgata* and *E. danica*, and the Grey Drake and Spent Drake are the females.

Of the above mentioned mayflies, *Ephemera*, *Ephemerella*, *Leptophlebia* and *Potamanthus* have 4 wings and 3 tails; *Heptagenia*, *Centroptilum* and *Siphylurus* have 4 wings and 2 tails, *Caenis* has 2 wings and 3 tails, and *Cloeon* 2 wings and 2 tails.

The mayflies found in amber¹ differ only slightly from existing forms and altogether nearly twenty fossil mayflies have been described, mostly from wing fragments only.

¹ See "Insects in Amber" by Dr. Malcolm Burr, THE MICROSCOPE AND ENTOMOLOGICAL MONTHLY, February 1939.