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BY

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AND

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**ORDER II.—EPHEMEROPTERA.**

*Ephemerida*, 69. Slight concentration of thoracic region of May-fly, 69; free motion of prothorax, 69. Mouth parts nearly obliterated, 69. Structure of wings, 69, significance of term "*Ephemeroptera*," 70; reason for substituting *Ephemeroptera* for *Plecoptera*, 70. Moulting, 70. Lubbock's observations on *Chloëon*, 70. *Oligoneuria rhenana*, 70. Morse's observations, 70. Scudder's account of May-flies on one of the Gull Islands of Lake Winnipeg, 71. General remarks on *Ephemeroptera*, 71, 72.

**ORDER III.—ODONATA.**

Favorable subject for observational work. *Libellula trimaculata*, 73. Directions for collecting and preserving dragon-flies, 73. Structure of head, 74; free motion of head correlated with habit of catching food when flying, 75. Size and concentration of thorax correlated with great powers of flight, 75. Mode of breathing, 76. Structure of abdomen, 76; toothed ridges developed in different species as adaptations to the similar habits of the insects, 76, 77. Large size of compound eyes, 77; small size of antennæ, 77. Mouth parts, 77, 78; carnivorous habits of dragon-flies, 78. Structure and position of legs correlated with peculiar habits of insect, 78, 79. Characters of the wings, 79. Ovipositor, 79. Development of dragon-flies, 80. Structure of larval dragon-fly, 80; simplicity of thoracic rings, 80. Mask of pupa, 81, significance of term "*Odonata*," 82. Brehms Thierleben, 82. Interesting habits of pupa, 82, 83. Respiration connected with locomotion, 83. Transformation of *Libellula trimaculata*, 84-88; time required, 88. Comparative length of life of larva, pupa, and imago, 88. Influence of surroundings on structure of aquatic and terrestrial forms, 88. General remarks on the *Odonata*, 88, 89. Specializations of the forms of this order, 89. Resemblances of the *Odonata* and *Neuroptera*, 89. Parallel or representative characteristics, 89.

**ORDER IV.—PLECOPTERA.**

Stone-flies, structure of body, 90. Character of wings, significance of term "*Plecoptera*," 90. Tracheal gills of larva

## ORDER II. EPHEMEROPTERA.

### EPHEMERIDÆ.

THE May-fly, or "day-fly," *Ephemera* (Pl. III., Fig. 29, p. 73), is so abundant in parts of the country where ponds and lakes occur that teachers may find it a convenient type. The body is long, and the three regions are loosely connected. The head is broad and short, and the compound eyes are widely separated, standing out prominently on either side. The prothorax (the rings of the thorax are not shown in the drawing) is freely movable. The mesothorax is the largest thoracic ring, and bears the large wings, while the small metathorax carries the small, hind wings. The antennæ (Fig. 29, *at*) are tiny, and the mouth parts have become reduced in size, since the imagos exist only for reproduction, and do not take any food.

The legs are extremely long; the first pair (Fig. 29, *l'*) is extended forward in a straight line in the drawing, and in this position may be mistaken for antennæ; they are slender, and of little use as legs. The last two pairs are attached to the sides of the thorax, and are not crowded closely together as in the dragon-fly, an insect which the May-fly resembles. The venation of the wings is simple, and in some species the posterior pair is wanting. The delicate structure of these organs, together with the ephemeral nature of the insects, has led us to sub-

stitute **Ephemeroptera** (ἐφήμερον, short-lived insect, πτερόν, a wing) for Plectoptera as the name of the order, and this avoids the confusion that arises from the use of the words "Plectoptera" and "Plecoptera," which are not only similar in their orthography, but the same in signification. The abdomen has two or three long, thread-like setæ or stylets (*se*). Some May-flies in their adult stage live only a few hours (hence the name of "day-fly"), though others live several days. The larval and pupal existence covers, however, as is often the case, a much longer time, lasting for a period of two or three years, and is passed wholly in the water. Pl. III., Fig. 30, is the larva; its respiratory organs are in the form of gills and are attached to the sides of the abdomen.

The larvæ and pupæ shed their skin many times. One genus, *Chloëon*, according to Lubbock,<sup>1</sup> moulted twenty-one times before reaching its full growth. The winged insect that first appears from the pupa skin is not the true imago, but represents a transitional stage, which has been called the subimago, and it is not till this subimago has cast its skin that the mature May-fly is seen. This is one of the few instances in which insects with fully developed wings continue moulting.

One species of this family, the *Oligoneuria rhenana*, is white. According to Kirby, it appears in such vast numbers on the Rhine after sunset as to resemble falling snow-flakes. In the morning nearly all, if not all, are dead. Morse has shown how myriads of Ephem-

<sup>1</sup> *Trans. Linn. Soc.*, London, 1863, 1865.

era are blown from the Great Lakes into the cities on their borders, and, attracted by light, settle on the gas-lamps.<sup>1</sup>

A Rochester Fellow,<sup>2</sup> in his amusing account of the American Eclipse Expedition of 1860, states that the May-flies occur in such numbers on one of the Gull islands in Lake Winnipeg that a member of the party on his return from a short walk was so enveloped with them as to wholly change the color of his clothing, and the water was covered with the exuviae of the ephemerae so that it was impossible to get a clean dipperful anywhere. The party found the western coast of the lake lined with a windrow of dead May-flies nearly a foot deep, which they traced from their canoe, for a distance of twenty miles.<sup>3</sup>

The **Ephemeroptera** continue to retain in their adult and larval stages several characters which have led some entomologists to regard them as the most primitive of all winged insects. The simple neurulation of the wings ; slow development through many moults of the adult, so that no lines can be drawn between larva, pupa and imago ; the stylets at the end of the abdomen, and the paired external openings of the organs of reproduction, are supposed to indicate a very primitive origin. On the other hand, the imago is farther specialized by reduction, resembling the

<sup>1</sup> See figure in *First Book of Zoölogy*, p. 103.

<sup>2</sup> See *The Winnipeg Country*, Cupples, Upham & Co., 1886, p. 92.

<sup>3</sup> This book is now published by N. D. C. Hodges, 47 Lafayette Place, New York, with the author's real name, Samuel H. Scudder, so that this story has an entirely trustworthy origin.



dragon-flies but with atrophied mouth parts. The sole function of the adult is, therefore, the reproduction of the species, and some of this group (*Cœnis*, etc.) have reached an extreme stage of specialization by reduction, being affected not only in their mouth parts, but also in the decrease of the number of wings to one pair, as in the *Diptera*, the hinder pair having become atrophied. Thus, while this group appears to indicate in part of its developmental history a very ancient and primitive origin, in another part, it shows that specialization by reduction has been at work, probably greatly altering the original ancestral form, and not only producing an existing adult type, whose field of work is solely the reproduction of the species, but also in the limited group to which *Cœnis* belongs, culminating with species that imitate *Diptera*.