On the Life-History and Habits of Clerus formicarius, Linn.

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With Figures 11-14.

THE family Cleridæ consists of soft-skinned beetles, generally gaily coloured (the "bunting" beetles of the Germans), with elongated bodies. The legs have five-jointed tarsi, but to prove this requires, in some cases, very careful observation. In habit both imago and larva are predaceous and carnivorous; where the imagines frequent flowers it is probable that besides taking honey they prey upon insects; indeed, Perris[1] has recorded cases of flower-frequenting Trichodes devouring other flower-haunting insects. The so-called carrion-eaters found amongst old carcases, skins, and bones may frequent these chiefly to prey on the insect fauna (imago and larva) found characteristically in such places.

A note on the habits of some Cleridæ found in Britain may prove interesting, as introductory to the observations made on *Clerus formicarius*.

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TILLUS ELONGATUS.—Its larva has been taken by Perris in the galleries of *Ptilinus pectinicornis*, a beetle destructive to furniture and woodwork by its borings.

TRICHODES APIARIUS.—This handsome red-and-blue beetle lays its eggs in hives, and its larva on hatching passes from cell to cell of the hive, devouring the bee-grubs. The larva of *Trichodes alvearius* has the same habit, but preys on the grubs of the mason-bee.

NECROBIA RUFICOLLIS.—The imago feeds on rotting flesh, and the larva preys upon the dipterous maggots and pupæ likely to be found on such putrefying material. The larvæ of an allied French species, *Necrobia ruficornis*, found by Perris, were preying on *Anobium paniceum*. This *Anobium* is harmful in houses to vegetable matter and to books. Perris got the various stages in a hornet's nest that had stood in his room for several years, and here the *Anobium* was being attacked by *Necrobia ruficornis*.

NECROBIA RUFIPES has been found on carcases and old bones.

CORYNETES CŒRULEUS has been recorded by Sharp[2] as entering houses and performing a useful work in destroying the *Anobium* species that mine into tables and chairs.

Clerus formicarius.

IMAGO.—I quote Fowler's[3] description. Elongate, anterior parts clothed with long pilose hairs, head large, black, coarsely punctured, eyes finely granulate, antennæ black, last joint with apex ferruginous; thorax about as long as broad, red, with anterior portion (which is divided by a broad V-shaped furrow from the posterior portion) black, coarsely punctured, posterior angles rounded; elytra depressed, parallel-sided, black, with the base red, strongly punctured in front, finely behind, with two strong bands of thick white pubescence, one before the middle very irregular, and the other behind the middle; legs black, with tarsi more or less ferruginous.

Fig. 11. Clerus formicarius. Imago magnified. From nature.

Found in England, Scotland, and Ireland.

LARVA.—The larva is rosy red. It has well-marked three-jointed antennæ, and on each side of the head five small simple eyes. The dark head is followed by twelve segments, of which the first three, or thoracic (each of which carries a pair of one-clawed legs), distinguish themselves thus:—The first has a brown chitinous or horny shield almost covering the upper side of the segment; the second and third each show two small chitinous spots or plates, one on each side of the middle line. The last body-segment has also a brown shield, and the body ends in two small cerci or projections.

Fig. 12. Clerus formicarius. Larva magnified. From nature.

PUPA.—The pupa, which is not enclosed in a cocoon, lies in a chamber or cell whose inner walls are lined with a whitish or greyish silvery secretion. The head and body are beset with hairs. The antennæ lie along the ventral surface, concealed in part by the first two pairs of bent legs. The wings reach about half-way down the abdomen, the hinder or lower pair showing slightly below the upper pair, each of which comes to a point. From the end of the abdomen two outwardly-directed spines project.

Fig. 13. Clerus formicarius. Pupa magnified. After Westwood.

LIFE-HISTORY AND HABITS.—Both larva and imago are, from the forester's standpoint, in the highest degree useful. The larva lives below the bark of conifers, such as pine and spruce, feeding upon the larvæ and pupæ and beetles of injurious species that infest these trees—*e.g.*, my last specimens were taken from below the bark of a *Pinus sylvestris* which was infested with *Hylesinus palliatus*.

Fig. 14. Clerus formicarius. Pupal bed in bark. By the courtesy of Professor Pauly.

The larvæ of *Clerus formicarius* are themselves able to bore into and tunnel the bark. While making observations on this beetle I placed several of the larvæ on the outside of some thick pieces of pine-bark. These soon buried themselves in the bark, and the glass on which the pieces of bark were resting under a bell-jar often showed little heaps of bore-dust from the tunnelling of the *Clerus* larvæ. Doubtless this

power of making galleries in every direction will facilitate their moving about in the search for prey.

The perfect beetle, found in conifer woods running over the bark of standing or felled trees, is also carnivorous, subsisting on destructive bark-boring insects. In the month of July I introduced a live *Clerus* (bred out of one of my pieces of pine-bark) into a glass tube which held four live *Hylesinus palliatus*. This *Hylesinus palliatus* is a small and destructive beetle which makes crutch-shaped galleries below and in the barkof pine and spruce and larch. For a quarter of a minute the *Clerus* ran up and down the inside of the glass, and then pounced upon one of the *Hylesinus*, seizing it in the weak spot in its armour, viz., on the under surface where the head is jointed on to the thorax. I lifted the tube to examine the more closely what would follow, lens in hand, when the *Clerus* started to run up and down the sides of the tube, and though it lost its footing several times and fell to the bottom, never for a moment did it let go its victim, whose antennæ were seen to be quivering nervously. At last, coming to rest, and propping itself on its two hind legs, the *Clerus* held the *Hylesinus* up to its mouth by means of the four front legs—a position also recorded by Ratzeburg.[4] First of all, the head of the victim was bent back and emptied by means of the jaws, and then the hind part of the body gutted in the same way. Finally the elytra were broken off and the wings torn to shreds.

In watching *Clerus* feed at different times, I noticed that the seizure of the prey was always at the same place, viz., between the head and the rest of the body. After a meal the beetle seemed to spend some time in cleaning itself, pulling its front legs through its jaws and the front legs over the antennæ.

Late one evening in July I placed in one tube three live *Hylesinus palliatus* and one *Clerus*, and in another tube seven live *Hylesinus palliatus* and one *Clerus*. Examination next evening showed that all the three *Hylesinus* in the first tube had been devoured, and five out of the seven in the second tube were only represented by scattered fragments of their external parts

No records seem to exist as to the length of life of *Clerus*

larva and imago, or of the time embraced in the pupal stage. In October 1897, on dissecting some pieces of thick bark from a full-grown pine-tree, I found larvæ of *Clerus formicarius*. I placed these pieces of bark under a bell-jar in an unheated room at the Royal Botanic Garden, and allowed them to remain until April 1898, when they were removed to a window in the Laboratory. I obtained imago-issue on the following dates :—

Two on June 29, 1898.
One ,, ,, 30, ,,
,, ,, July 12, ,,
,, ,, ,, 21, ,,

On July 14, 1898, a piece of newly-felled pine-stem was placed in a cotton sack and four of the *lerus* imagos introduced along with a number of live *Hylesinus palliatus*. The sack was allowed to stand out exposed to all weathers. At intervals up to September 30 I made examination and found the Cleridæ alive, and now and again I added fresh *Hylesinus*. On examination the *Clerus* beetles would either be found in hiding, lying close, under a piece of loose bark or a bark-scale, or else running over the log with their characteristic active and eager movement.

On January 3, 1899, I removed the log from its sack, but could find no trace of my *Clerus* beetles. Trusting that they were in winter quarters concealed in the bark crevices, I returned the log to the sack. On opening the sack again on February 25th I noticed a *Clerus* running about. The beetles continued to live till the end of May 1899. On June 3rd, eleven months from their appearance as imagos, I found three of the four lying dead ; the fourth had probably escaped by a hole in the bottom of the sack where the pine-log had worn the cotton through. These four *Clerus* beetles had appeared, after pupation, in June and July 1898.

In July 1899 I bred out another *Clerus* imago, under the following interesting circumstances. On August 24, 1898, I removed two *Clerus* larvæ from below the bark of a pine where they had been since April 15, when the piece of pine came into my possession. One of the two larvæ was placed in a

glass tube temporarily, but when I came to look for it on August 25 I found only bore-dust in the tube; the larva had buried itself in the cork.

The corked tube was then placed under a bell-jar to prevent escape of the *Clerus* larva should it bore right through the cork into the open; the tube was left undisturbed until October 12th.

On the cork being removed from the tube on October 12, the larva could not be seen, as its entrance-hole was plugged up with bore-meal. The cork was carefully cut in two and the larva found lying in the hollowed-out centre. The two parts of the cork were carefully fitted together again without disturbing the larva, and the cork then returned as the stopper of the glass tube.

At various dates up till April 14th, 1899, I looked in, and the *Clerus* still remained in the larval condition. On May 3rd the two pieces of the cork seemed to be sticking together, and a more careful looking showed the silvery whiteness with which characteristically the *Clerus* larva lines the cavity in which pupation takes place. Up till June 3rd there was no pupation, but by the next examination, on June 6th, the larva had pupated. The pupation-stage lasted till July 6th, and by July 7th the perfect insect had made its way out of the cork and was running about in the inside of the bell-jar, more than ten months from the day of the larva having entered the cork.

LITERATURE.

1. Perris. Larves des Coléoptères, 1878, p. 215.
2. Sharp. Insects, Part II., p. 255. The Cambridge Natural History.
3. Fowler. British Coleoptera, Vol. I., p. 262.
4. Ratzeburg. Die Forstinsekten, p. 36.