

## BIOLOGY.

Stoneflies in their immature stage are all inhabitants of running water, and so are to be sought as adults in the vicinity of streams. There is hardly a better way of obtaining the smaller and less active species than the old-fashioned entomologists' method of beating the bushes over an inverted umbrella, or sweeping the streamside vegetation with a heavy beating net. Many of the larger Perlidae are attracted to lights at night and may be sought about the street lamps near streams. The senior author once found the stout-bodied stonefly *Acroneuria pacifica*, clinging in numbers to young pine trees on the steep slopes of the Yellowstone Canyon, and obtained specimens very easily by shaking the trees, dashing the stoneflies to the ground, and picking them up before they had run to cover.

Only a few forms, mostly the greenish ones, are active by day, and run about over foliage. For the most part they do not take flight quickly, but many of them run rapidly and slip into hiding places most adroitly. Adult stoneflies may be collected even in northern latitudes every month in the year. The small black Capniidae are the winter forms. These are usually seen on warm days in winter on fresh banks of snow, where their color makes them conspicuous. A number of dusky-winged Nemouridae next follow in early spring. The big Pteronarcidae come next, and the Perlidae fill out the season. Most characteristic of midsummer are the greenish, diurnal foliage-inhabiting stoneflies of the genera *Isoperla*, *Alloperla*, and *Chloroperla*.

The immature stage (larva, nymph or naiad) resembles, in general, the adult, but the wings are lacking and they always occur in water, either under stones or under drifted leaves, debris, etc. The mouthparts are of the biting type and are well developed. As far as we know, all nymphs possess long filamentous, many-segmented cerci. Tracheal gills are present in most genera and are mostly of the filamentous type. The gills may occur in tufts, or as single filaments and are placed on the sides of the thorax, on the sides and tip of the abdomen or in the cervical region. In *Taeniopteryx* they consist of three-segmented filaments attached to the coxae. The gills persist in some of the adults, but are non-functional.

Comparatively little work has been done on the biology of stoneflies. At least one year seems to be required