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- instar larvae and all pupae were *Simulium (Gnus) defoliarti* Stone and Peterson and the rest of the larvae (3 fourth instars and 26 fifth instars) were *Prosimulium (Heldon) onychodactylum* Dyar and Shannon. The material is deposited in the Insect Museum, Department of Entomology, University of California, Riverside, California.

S. defoliarti was 1st described by Stone and Peterson in 1958, having widespread distribution in many of the mountain creeks and streams of the western United States. In California, this species was collected from Alpine, Eldorado, Fresno, Inyo, Plumas, Sierra and Trinity Counties. Larvae and pupae of *S. defoliarti* were collected from rough, turbulent water with a current velocity of 100.6-167.6 cm/sec and as low as 25 cm/sec. Stone and Peterson (1958) found *S. defoliarti* to overwinter in the egg stage, larvae appear in late May or early June and adult emergence peak in mid-July. Recently, female adults of *S. defoliarti* were reported by Fredeen (1977) as an economic livestock pest which, together with *Simulium arcticum* Malloch, inflicts vicious and sometimes fatal massive attacks on animals in British Columbia, Canada.

P. onychodactylum was first collected and described by Dyar and Shannon in 1927 from Long's Peak, Colorado at an altitude of 3,353 m (11,000 ft). Wirth and Stone (1956) reported the occurrence of *P. onychodactylum* in California, however no detailed distribution was given. It is believed that this species has one generation per year in Utah (Peterson 1959) and overwinters in the egg stage in Alaska (Sommerman et al. 1955). In western Canada, larvae of *P. onychodactylum* are generally found from May until mid-July in streams with varying water velocities. The larvae and pupae attach to various aquatic vegetation, submerged sticks, branches and rocks (Peterson 1970). The cocoons of *P. onychodactylum* are often seen densely covered with small rock particles which makes it difficult to find the pupae (Peterson 1970). Two pupae with the same characteristics were collected from the Indian Creek, San Jacinto Mountains (altitude = 1646 m) in May, 1978, in a 2-year ecological study (Mohsen and Mulla, unpublished data) and were sent to B. V. Peterson for identification. Their identity, however, was not possible to confirm because they were early pupae (B. V. Peterson, personal communication). *P. onychodactylum* seems to prefer cool creeks, streams and rivers located at high altitudes (1646+ m) in the San Gorgonio and San Jacinto Mountains of southern California.

ADDITIONAL RECORDS OF *SIMULIUM DEFOLIARTI* AND *PROSIMULIUM ONYCHODACTYLUM* FROM SOUTHERN CALIFORNIA

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On August 11, 1980, 34 larvae (3 second and third, 4 fourth and 27 fifth instars) and 18 pupae were collected from a small cool creek in the San Gorgonio Mountains, San Bernardino County, California. The majority of the larvae and pupae were aggregated on the rocky substrate of the bottom in the swiftest parts of the creek where water velocity was in the range of 70-150 cm/sec. Upon identification, the 3 second and third instar larvae were found to be *Simulium (Hearlea) canadense* Hearl; samples of the rest of the collection were sent to Dr. B. V. Peterson, Canada Department of Agriculture, Ottawa, Canada, for identification.

The larval and pupal materials were determined as follows: middle and I penultimate

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A RAPID TECHNIQUE FOR EXTRACTING SALIVARY GLANDS FROM LIVE ADULT BLACK FLIES (DIPTERA: SIMULIIDAE)

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Our investigation of the salivary gland proteins of some blood-sucking black flies of the dipterous family Simuliidae required us to devise a technique for the clean, rapid, extraction of large numbers of salivary glands from living flies. Rapidity of procedure was required for completing the dissection of large series in each sample, as well as for minimizing autolytic deterioration of the material during the process prior to quick-freezing storage. Rapid dissection was required also to maintain uniformity of age class in any given sample, because the condition and composition of the salivary glands of these flies undergo changes during the first few days of adult life. We believe that our procedure may be helpful to other investigators of salivary glands of flies.

Several workers have referred to the location

of black fly salivary glands (Cox 1938, Krafchick 1942, Smart 1935, Wenk, 1962), some with detailed anatomical descriptions (Cosbee et al. 1969, Wachtler et al. 1971, Welsch et al. 1968). However, removal of these glands is not so well documented. Bennett (1963) described a technique for gland removal in which he first cut the thorax with a pin, pulled on the head, and then extruded the glands through the severed thorax. Poehling (1976) used a similar technique for his study of salivary gland proteins. Here we describe a faster and simpler technique.

Simulium vittatum and *S. decorum* adults, reared in the laboratory from larvae, were maintained at 13°C (55°F) and 85% R.H., prior to dissection. Although any number of flies could have been prepared for dissection at one time, we found fifty to be a suitable number to handle easily.

The selected flies were immobilized with a stream of carbon dioxide, enabling us to sex them and to transfer them to an 8 cm × 1 cm glass tube. The test-tube, which had been previously chilled in a freezer, was then dropped into a custom-made ice jacket. This receptacle was made by freezing a styrofoam mug of water around an empty test-tube, and then removing the latter to leave an equal sized cavity in the ice. While the fly-filled test-tube was held in this ice cavity, the flies remained completely immobilized.

For the dissection 1 fly at a time was removed with forceps from the holding tube, and plunged under insect ringer's solution contained within a raised-ring calibration slide. The slide and contained specimen were then placed under a stereoscopic microscope at a magnification of approximately 50. For a right-handed worker we found it easiest to secure the fly by the upper abdomen by using forceps held in the left hand. A pair of extra-fine forceps (Dummont #5 Biologie) in the right hand, was used to grasp the head and pull it clear of the thorax at the neck membrane. In this way the salivary glands were drawn out of the thorax and remained attached to the head, still held by forceps in the right hand. The remaining carcass was discarded, freeing the left hand to make the final break between the glands and the head.

The entire dissection process took only 10 sec per fly after it was lifted from the ice jacket.

For our purposes the dissected salivary glands were removed from the slide with a minuten pin mounted on a tooth-pick. The glands were then frozen for later protein analysis.