Park on Mt. Rainier before there was anything but a trail into the area; and every few years since, he has made additional excursions into the region, his collecting being confined for the most part to south of the international border.

Ralph Hopping (1868-1941), a former member of this Society, from 1919 to 1939 was entomologist in charge of the Dominion Forest Insect Laboratory at Vernon, B. C. He assembled an extensive collection of Coleoptera, much of it from British Columbia, that came to number about 10,000 species and 97,000 specimens. With the exception of a portion belonging to the Vernon laboratory, it was purchased by the California Academy in 1948, and is gradually being absorbed in the general collection of the Academy.

Hugh Leech will be remembered by many here as the energetic and efficient secretary and editor of our Society. Since 1947 he has been happily employed as associate curator of insects at the Academy. He lives at rural Mill Valley, about 12 miles north of the Academy across the Golden Gate Bridge. His collection of about 130 boxes of water beetles, rich in British Columbia material, has been transferred to the Academy.

After returning from California, there remained only a trip into southwestern British Columbia to complete my survey of Northwestern beetle collections. Taking advantage of our Thanksgiving holiday, Estelle, our daughter, and I took the night ferry for Victoria. Nov. 24 I spent with Mr. G. A. Hardy at the Provincial Museum. Mr. Hardy has a collection of 50 or more double boxes of beetles, and has specialized, as we all know, on Cerambycidae, Buprestidae, and Elateridae. The museum has several collections that have been given to it, but so far these remain in their original boxes and have not been organized into a single whole.

The next day we drove north along Vancouver Island nearly to Wellington where we had lunch with Mr. Richard Guppy, Mrs. Guppy, and her sister. Mr. Guppy is another member of this Society. He has a chicken ranch, and has a collection of Vancouver Island Coleoptera and Lepidoptera. His beetles fill about a dozen boxes and drawers and is quite complete, considering the restricted area of his specialization. Mr. Guppy sells Vancouver Island insects to interested parties.

That evening we ferried over from Nanaimo to Vancouver, where we were entertained by Prof. and Mrs. G. J. Spencer. Prof. Spencer is in charge of the insect collections at the University of British Columbia. The beetles were arranged in 25 or 30 drawers some years ago by Mr. George R. Hopping, son of Ralph. Prof. Spencer introduced us to W. Lazorko, M.D., a refugee from Lemberg, Galicia, who had been in Canada about 18 months, in Vancouver about 11 months. He has a collection of some 300,000 beetles, 50,000 of them mounted, and 5000 or 6000 specimens from Vancouver. He is specially interested in the Carabidae and may well be heard from scientifically when he becomes settled in the New World.

This concludes my account. I do not assert to have mentioned all the Coleopterists in the Pacific Northwest, but only those I encountered in 1949.

UPON THE MATING HABITS OF THERMOBIA DOMESTICA PACK (Thysanura: Lepismidae)*

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In the course of a study of the bionomics of *Thermobia domestica* Pack, the firebrat, it was frequently noted that females follow males for long periods of time. Under the impression that this chase was some part of mating reactions, the performance was watched until it reached a climax. The process or "love-dance" may last one and one-half to two hours and is somewhat as follows:

* Contribution No. 294, Department of Entomology, University of Illinois, being a revised portion of a Master's Thesis presented to the Department.

The larger female follows the smaller male which seems very restless, moving from place to place after a few minutes in each position. As soon as the male comes to rest, it turns and faces the female and both touch their antennae at close quarters with many rapid movements and then stay quiet. The male then turns again and moves away, followed by the female and the process is repeated over and over again for long periods. In its wanderings around the cage amongst many other firebrats, the male may get separated from the female by a space of several inches and the angle or corner of the cage. The female then runs around in all directions and seems to pick up the trail of the male very much after the fashion of a bloodhound.

Now at the tips of the caudal sterna, the coxites of Walker or coxopodites of Snodgrass which flank the base of the male pseudocercus, are short unbranched setae in connection with relatively enormous, simple glands occurring in two series. There are six glands on each side dorsally and three on each side ventrally; the glands from the tip to the base of the seta above it, average 0.134 mm. long by 0.016 to 0.02 mm. broad. It is possible that either these glands or the eversible vesicles which occur on the coxopodites mesad of the styli, function at mating time as scent glands and provide the scent which the female follows when in pursuit of a male.

This love dance has been watched several times for an hour at a time but no climax took place. On five occasions, however, its completion was observed. The climax occurs when the movements of the male become more rapid and he does not run away from the female but turns around in a circle on a short axis, pausing every few seconds to touch antennae with those of the female while the latter now remains perfectly quiet, crouched low on the floor with antennae lying straight ahead of her. Each time the male turns around away from the female, he raises the tip of the abdomen in the air and waves it about. Finally on the under side of the tip of the abdomen there suddenly appears a semi-transparent pyriform spermatophore about one millimeter in length with the broader end discharged first and pointing caudad. In no more than three seconds from the moment of its appearance, the spermatophore is deposited on the floor just about three quarters of an inch directly in front of the female. The male then turns immediately, touches the female's head with his antennae which move at great speed in short, rapid jerks and turning abruptly aside, he moves away. Body raised up on the legs, the female then moves straight forward, passes over the spermatophore and presses the base of the ovipositor on it. Two very small drops of liquid are present at the base of the ovipositor and the spermatophore adheres to the abdomen of the female. She adjusts it by one or two slight touches of her mouth parts and as nearly as could be seen, makes a rent in it with the tips of the maxillae; a small quantity of liquid extrudes without, however, changing the shape of the object.

The contents of the spermatophore are absorbed by the female over a period of several hours. On three occasions when the absorption was noted it took one and one-half hours, four and one-half hours and overnight respectively. The walls of the spermatophore then drop off and are likely to be eaten by the female if not taken away from her. Microscopic examination of the empty receptacle showed no spermatozoa, only a thin chitinous case and some gelatinous material.

If there is any doubt as to this being an externally deposited spermatophore, the matter could readily be solved by removing it immediately after deposition and examining the contents microscopically for active spermatozoa. Since the whole procedure was observed only five times and it was necessary to determine the pre-oviposition period, this examination was not made.

The pre-oviposition period as observed in two instances, is from one and one-half to four and one-half days; the female that absorbed the contents of the spermatophore in the latter period laid eggs thirty-six hours afterwards.

Apart from the observations and findings reported above, it would be difficult for these firebrats to copulate in

the normal manner of insects, in view of the extreme shortness of the male aedeagus which is relatively a minute, latent, oval tube; the entire absence of secondary copulator mechanisms or "grappling hooks," and the long, closely-knit bases of the dorsal and ventral valvulae of the female ovipositor, between which it would seem impossible for such a short aedeagus to penetrate.

A COMPARISON OF POTATO TUBER DAMAGE BY TWO FLEA BEETLES, EPITRIX TUBERIS GENT. AND EPITRIX SUBCRINITA (LEC.) (COLEOPTERA: CHRYSOMELIDAE)

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In the course of a recent investigation into control of flea beetles on potato, at Kamloops, B. C., the question arose as to whether the western potato flea beetle, *Epitrix subcrinita* (Lec.), caused the same type of damage to potato tubers as its close and more numerous relative, the tuber flea beetle, *E. tuberis* Gent. A small experiment was set up at the Dominion Laboratory of Plant Pathology, University of British Columbia, to make a comparative study of the damage caused by the two species.

Collections of the two species by C. L. Neilson and D. G. Finlayson, Dominion Field Crop Insect Laboratory, Kamloops, B. C., from potato fields near Kamloops were sent to Vancouver. A group of 12 individuals of each species was placed on a potato plant in each of three cages. The external sexual characteristics being difficult to see in living specimens, the ratio of males to females was not known. Each group was a random sample.

The cages were developed from a type in use at the University of California. They were cylindrical, 30 inches high, the ends being 15 inches in diameter and made of 5-ply wood, with a 5½-inch hole in each. The ends were joined by four uprights and between two of these was a 9-inch pane of glass. The remaining three side panels were covered with organdy. The potted, caged plant grew up through the hole in the bottom. Cotton batting made an insect-tight filler at the rim where the cage rested on the pot. The host plants were White Rose potatoes from a single parent plant, growing in 10-inch pots. At the start of the experiment they were about 2 feet high. The soil moisture was maintained from water poured into saucers in which the pots were set. The cages were kept in a greenhouse and inspected daily. The beetles were introduced into the cages on July 29, and taken out on October 6. Emergence of second-generation adults started during the last week in September but was not complete by October 6.

When the soil was washed from the root systems, it was found that both species severely damaged the root, rhizome, and tuber. Tunnels up to four per inch were found in the rhizomes. In one cage containing a heavy population of *E. tuberis* some of the rhizomes were completely cut off. In all the cages many of the fibrous roots appeared to be cut and shortened. A thin peeling was taken off the tuber before damage marks were counted and for each species 50 tunnels in the tubers were chosen at random and measured at a depth of approximately 1 mm. The average length of tunnel in each instance was 2.5 mm. The range was from 1.0 mm. to 5.0 mm., with 40 per cent 2.0 mm. long and the frequency distributions were almost exactly the same for the two species. There were few surface tracks.

Under the conditions of the experiment, *Epitrix subcrinita* produced a substantial amount of tuber injury, practically identical in nature with that produced by *E. tuberis*. Both species also damaged roots and rhizomes severely. It does not follow, however, that the same results would be secured in experiments conducted in the field, or in field cages.