NOTES ON GRYLLOBLATTA AT KAMLOOPS

By the late MATTHEW GEDDES CAMPBELL, presented by G. J. SPENCER
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In the autumn of 1938 it was my good fortune to get into correspondence with Mr. M. G. Campbell who worked in the post office at Kamloops. Mr. J. D. Gregson of the Dominion Entomological Laboratory had told me that Campbell was a keen amateur entomologist who had become interested in *Grylloblatta*, which Gregson had recently found at the foot of Mount Paul, Kamloops, so I wrote to him in connection with this insect. For one reason and another, the correspondence lapsed until September, 1940, when Campbell happened to listen to a broadcast in which I had mentioned *Grylloblatta*, and wrote again, this time from New Westminster where he had been transferred for over a year. A letter came from him on October 7th and in the evening paper of that day, appeared a notice of his death. The notice read: "New Westminster, Oct. 7.—Fatally injured in a traffic accident shortly after midnight Saturday at Sixth Street and Eighth Avenue, Matthew Geddes Campbell, 47, postal clerk, of 1009 Fourteenth Ave., Burnaby, died in the Royal Columbian Hospital at 6:55 a.m. Sunday."

Shortly afterwards I wrote to his widow concerning his observations and notes on *Grylloblatta*, but received no reply; I wrote again in autumn 1947 to the same address, and since there has been no answer, it is possible that Mrs. Campbell has moved elsewhere. Because his letters to me in 1938 contained interesting records on *Grylloblatta*, I feel that they should be published, especially since he gave me permission to do so. From his correspondence I have picked out sections to make a fairly consecutive narrative, with a little editing.

"Last Sunday (6 Nov. 1938) I was successful in capturing a number of *Grylloblatta campodeiformis* on the slopes of Mount St. Paul and brought them home alive. (The bottom edge of Mount St. Paul, Kamloops, where *Grylloblatta* occurs, is only about 1,400 ft. above sea level. G. J. S.) I have prepared a case for them and will ship them to you. . . . As you know, these insects are very susceptible to changes of climate and can live only between 30°F. and 40°F. . . . There are 15 or 20 specimens. I had about 25 originally but some may have been killed or injured by larger ones or by jolting on the way over. A friend of mine, Mr. Consett Davis of the University of Sydney, Australia, who is at present studying at the University of California, Berkeley, will be returning to Australia on the 'Niagara' leaving about 20 Dec. I promised him some time ago that I would try to get him some live *Grylloblatta*, so if you do not mind taking care of them until his arrival, I would suggest that you divide them equally.—There is a bare possibility that Mr. Davis may have time to come up here but we may get a cold spell and then *Grylloblatta* goes away down under tons of rock and is difficult to find. Snow or zero weather may drive them down before I can make another raid. If they reach you in good condition, I would suggest that you keep them in soft rotted humus, between 30°F. and 40°F. They will freeze at about 26°F.

(19 Nov. 1938). "I was much relieved on receiving your letter of 16th inst., to know that the *Grylloblatta* arrived safely. I probably shot them at you rather suddenly and it requires a little preparation to receive such guests properly. . . . I intend to go out tomorrow (Sunday) afternoon. . . . . Mr. Davis will be in Montreal for a few days before the 28th Nov. and I am planning to send him two lots, one by express and one by air mail. I understand that they can keep them at about the right temperature on the fish rack in the express cars. . . . I have a batch in my basement that I can send Mr. Davis if I am unsuccessful in my hunt

tomorrow. Usually I go out hunting in the morning but for your purpose (to examine the stomach contents soon after a meal) it will be better if I catch one in the evening and send it on the night train. . . . no use examining the gut of those two large females I sent you because one or other devoured a good big male nearly as large as they are, just before I sent them off."

(21 Nov. 1938). "I am sending to you by this mail, two specimens of *Grylloblatta* which I caught about 10 a.m. this morning and killed in 70% alcohol. . . they are not quite as big as I would have liked. . . . . Had a busy morning and caught about 25 though they were mostly small. About 20 of these, I am sending off tonight by air mail, special delivery to Mr. Davis at Montreal. It is a long chance but worth the risk. I could not go out on Sunday as planned; the train wreck delayed me at my work but I made good this morning. Mr. Gregson and three others were out Saturday afternoon but drew a complete blank. I still have a number of specimens on hand."

(5 Dec. 1938). "I have handed my remaining specimens over to Gregson. . . . as I work in the post office I will be very busy for the next two or three weeks. . . Mr. Davis sent me word from Montreal that he had received the batch I sent him. Some perished on the trip and not relishing the responsibility of looking after them on an 18,000 mile trip, he "dunked" the lot in Carnoy's fixative. (The Shirker).

"As you know, I am very interested in this strange insect and have collected quite a file (of notes) on him. Last winter I kept a number in captivity, some of which died and were pickled and sent to Davis. Gregson also kept a few but I understand they too died when the weather became hot. Therefore I hope you will not mind my offering some suggestions from the experience I gained last winter. I have made many trips to Mount St. Paul and must have collected more than a hundred specimens. . . . I trust you will find my observations of some value. . . . You are quite at liberty to use or quote any of this (material) you wish. It is merely my hobby, something I play at and I have had a lot of fun and interest out of *Grylloblatta* and expect (to have) lots more.

"A great deal of sheer bunk has been written about this poor creature. I am thinking of a picture of him that appeared in an Alberta paper, showing the insect on a block of ice and stating that if removed from the ice he would have convulsions and die in a few hours. Some I caught early last March survived until the end of June with never a bit of ice, just in a glass biscuit jar in my basement. I had difficulty in persuading even Gregson that they would perish if exposed to five or six degrees of frost, at the same time as the newspapers were making quite a song about the poor things 'roasting' to death in a refrigerator. I lost all of a dozen specimens before the truth dawned on me. Or, as I explained to Davis, it does NOT need to be cold enough to freeze the appendages of a brazen simian, in order to suit *Grylloblatta*. Altogether too much has been made of this temperature angle, ever since he was badly misnamed 'Ice Bug,' A 'Rock Louse' would be a much more appropriate term. Give them lots of well-rotted humus to prowl in, a few rocks to hide under and you will have no more trouble with them than with a bunch of earthworms. Here (in Kamloops), we have sub-zero temperatures to protect them from as well as temperatures over the century mark, but down there (in Vancouver), with the exception of a little ice in July and August, they should live in your normal, outside, temperatures. Mine were alive and active when the thermometer on the verandah showed 75°F., but the temperature in the basement [where they were kept. (G.J. S.)] was about 60°F. I am convinced that if they had had more humus to protect them, they would have survived [all summer. (G.J.S.)]. I did not give them more humus because I could not then have observed their reactions.

"I will put the remainder of this on

separate sheets so that you can file, or refer to them apart from this letter."

Mr. Campbell's "NOTES ON GRYLLOBLATTA" (Transcribed with a few changes, and translocations of sentences, by G. J. Spencer).

ON HABITS OF GRYLLOBLATTA.—

"Since most of the work hitherto done on this insect has been of a laboratory nature, and as I have no equipped laboratory, I have concentrated more on his habitat and plant and insect associations. Much may be learned about him from a study of his extraordinary habitat. Here (in Kamloops), he occupies a range of rock slides about a mile in length and I have found *Grylloblatta* all along these slides from one end to the other; amongst large boulders so big as to require a crowbar to turn them over and amongst gravel the size of a small pea. Generally speaking, the large ones are found amongst the large rocks and small ones amongst the small rocks but I find it more convenient to divide his habitat into three zones.

A. "The front part or edge of the slide (farthest from the talus slope), where vegetation begins amongst the large, loose, scattered boulders. This is where the large, amber-coloured adults are to be found. Sage brush is here the dominant plant (*Artemisia tridentata*) and sage seeds are scattered all through the humus (duff). Here also occur several species of grasses, Saskatoon bushes (*Amelanchier*), Oregon grape (*Berberis* prob. *nervosa*) and an occasional Jack pine (yellow pine, *Pinus ponderosa*).

B. "Area about one foot in from the edge of the slide where winds have blown in a light covering of leaves and humus (has formed amongst the rocks). This is the home of the medium-sized, grey ones and, in springtime, of white (nymphs in) early instars.

C. "In area deeper down amongst the older, deeper humus, are found little white nymphs of early instars.

"When disturbed, *Grylloblatta* always goes UPWARDS, that is, towards the mountain, further into the shelter of the rocks. Even when trapped with a spoon, they will not turn outwards but will climb over the spoon in their attempts to get into the shelter of the hill.

"After searching in one place for a little time, even though several specimens may have been found there, further search is generally fruitless; the disturbance caused by moving rocks, alarms them and they scatter deeper into the hill. Here I quote Dr. Norma Ford: 'The next morning I *expected* to take at least forty specimens, and literally no stone was left unturned in the swampy ground as I worked in ever increasing circles from the point of the first capture. But not a specimen was found.' Dr. Ford seemed to obtain hers in boggy, wet soil; most of my captures have been made under conditions of drizzly 'Scotch mist.'

"This autumn I was due for another surprise. Thinking that I was really clever, I decided that since the summer had been very dry, *Grylloblatta* would be found in the little gullies that run down from the tops of the cliffs where water would trickle down and settle (in temporary low spots). Strangely enough I had no luck in these places, but found him away out on 'bone dry' spurs under exceedingly dry, dusty conditions. Moreover, while prowling over the hills on the west side of the North Thompson river in the spring (of 1938) I found one specimen, about two miles west of Mount St. Paul and on the other side of the river. [Note: this would be on the east slope of the Batchelor hills which drop abruptly to the North Thompson Valley; there is little or no talus on these hills which are extremely dry. (G.J.S.)]. However, I was foolish enough to put him into a can with a large silver fish [Machilidae (G.J.S.)] and when I got home there was only one very fat silver fish. I never found him in a high, either hot or cold wind, nor when the thermometer was above 50°F. although I have found him when it was as low as 15° or

20°F., buried in a deep bed of humus. That was cold hunting.

"That he can survive and get along nicely when temperatures are below zero, (as sometimes happens at Kamloops), does not surprise me much. An inch or two of snow and a few inches of humus give him all the protection he needs.

"But where does he go in summer, when there isn't a drop of rain for months and the rocks at the foot of the talus slope sizzle in temperatures up to 120°F. for 12 or 14 hours a day? He must have certain selected places deep down, covered with two or three feet of rock, with a layer of humus available and a means of retaining moisture. That he goes into a sort of dormant state (aestivation) in summer, I have no doubt.

"Of the insects that occur in the *Grylloblatta* association (may be mention), a small green fly; the aeroplane moth that folds itself up to look like a monoplane or like a cross of two pieces of dry stick [Pterophoridae. (G.J.S.)]; a few centipedes, an occasional nest of termites [*Reticulitermes hesperus* (G.J.S.)], the occasional silver fish and several species of spiders. I have not seen any true ants in his direct neighborhood but in the autumn, plenty of grasshoppers, wasps and bees crawl amongst the rocks for shelter from the cold nights. While adult *Grylloblatta* are out hunting grasshoppers stiffened by cold, the large, swift-moving spiders are in turn, hunting *Grylloblatta*; spiders are really the most dangerous enemies of adult *Grylloblatta* until the weather gets too cold even for them. . . . Full-grown, adult *Grylloblatta* are distinctly carnivorous, and are fiercely combative prowlers and hunters . . . although the earlier stages *may* eat decaying vegetable matter . . . as of moss and other primitive plants . . . However there is hardly any moss on Mount St. Paul and I have not noticed any where *Grylloblatta* is found; higher up the mountain where there is some moss, I have never found him.

"We know that even medium-sized ones will devour grasshoppers, wasps, bees and cockroaches. I tried some ants on them and also ant pupae but *Grylloblatta* was not interested after the first smell. (However) on several occasions I have found adults (apparently) waiting at the top of a burrow of termites. Whenever I found a termite run I would turn over a couple of rocks above it and usually found one or two *Grylloblatta*. Although Dr. Ford claims she found three adults under one flat stone, I have rarely found more than one at a time.

"I wish I could get over to the mountain about this season (6 December). After devouring all the frozen (autumn) insects, *Grylloblatta* will undoubtedly go on to reproduction. I feel sure that in this locality, this is his mating season."

CARE OF GRYLLOBLATTA IN CAPTIVITY.

"My temperature records are not in any sense scientific, but I did observe (the creature) under many and varied conditions, summer and winter, in captivity and in his (natural) habitat. . . . I feel certain that a study of his life would add much to biology. How I regret now the opportunities I passed up of qualifying myself to make such a study. . . I do not see how I, an untrained man, can add much to the work that has been done by Drs. Walker and Mills and Pepper. However, if anything I can do will benefit science in the smallest degree, you are more than welcome to it.

" . . . In simulating natural temperature conditions here (in Kamloops) the range would approximate: October to April, day 80°F. to 0°F.; night, 50°F. to —20°F. May to September, day 120°F. to 50°F.; night, 75°F. to 40°F. . . . (To meet these conditions) I would suggest that the insects be stored in two chambers:

(1) A large bucket (of wood) or a can, for general storage. (This should have on the bottom) a layer of clay, then a layer of stones of about one inch diameter, 3 or 4 deep, and on top of this, a deep layer of moist, loose humus. This large container can be stored in a cool dark basement and provided with a per-

forated tin lid for holding ice in summer, and will provide shelter from excessive heat or cold. If ice is used, a drainage hole should be provided in one side just below the rocks, above the layer of clay. (Paraphrased. G.J.S.).

(2) An observation chamber. A glass-sided box, 12 inches square and 2 inches wide, with wooden or metal ends and bottom, open at the top. This should contain two layers of stones of one inch diameter, continued up one side; on top of the stones, a layer of clay an inch thick to hold the stones in place, especially those up the side. Then another layer of inch-diameter stones with several layers of small pebbles on top (and finally, the narrow chamber should be) filled up with loose, damp humus.

"The stones up one side of the chamber are for summer use; on them should be placed a small perforated can containing ice whose dripping can leak down the stones and along the bottom to keep the whole chamber cool and moist without making the humus marshy. A draining hole on one end, at the rock level and below the clay, will let out excess water. This observation chamber should be kept on a solid bench or on a table where slamming doors or other vibrations will not disturb the insects, and should be sprayed at intervals with a fine mist of water to simulate rain. Since this chamber is so narrow, the insects can be observed through the glass sides as they move up and down. As they are very sensitive to light, a red light should be used for observations. (Paraphrased by G.J.S.)

CONCERNING FOSSILS.—

"That fossil forms of *Grylloblatta* have not been found to date, is not very surprising since *Grylloblatta* himself has been known to science only since 1913. Most of our fossils are 'split out' from layers of sedimentary rock. But *Grylloblatta* will not be found in such layers; he will be found in a hard conglomerate since he was swept down the hillsides by slides and avalanches and buried. I have been working a little on that angle during the summer but with so little time to do it in, of course I have little success to report. I found no *Grylloblatta* (in the rocks), only leaves and twigs."

POSTSCRIPT BY G. J. SPENCER.—

In his last letter to me written on October 4, 1940, Mr. Campbell said . . . "Since I came down here (to New Westminster) I have had a notion to explore the foothills near the Lions and Grouse Mountain or the hills north of a line (drawn from) Sardis to Chilliwack where I believe *Grylloblatta* may be found, or even around Yale and Hope. If you have any students keen enough and possessing a car, I wouldn't mind making a two- or three-day trip, sharing the expenses, when I get my holidays. If you have any enthusiasts along this line I would be glad to hear from them and make arrangements." He was killed three days later.

We have here a remarkable series of observations by a man, who, while deploring his lack of education, had sufficient enthusiasm and enterprise to spend many hours of his limited free time, combing the Kamloops hills for an insect which fascinated him. Never once in his original notes does he call *Grylloblatta* an "insect" or speak of it as "it"; it was always "he," "him," or "*Grylloblatta*," a real personality, and he maintained cultures in his basement in the face of some slight hostility from his family.

Mr. Campbell's notes bring up many points for discussion, but I would emphasize only two at this time; *one*, that the Kamloops *Grylloblatta* is apparently a separate race from the Banff-Jasper high-altitude, snow or ice-edge form, and one which can tolerate temperatures far above those of the mountain form, and, if Mr. Campbell's records are correct, it is a form that freezes to death with only 6 degrees of frost, and *two*, that precise and detailed studies of the Kamloops *Grylloblatta* are long overdue.