

The Dermaptera and Orthoptera of Vancouver Island, British Columbia

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Vancouver Island, together with Queen Charlotte Islands, constitutes the unsubmerged portions of the most westerly of the mountain ranges of British Columbia. Beyond these islands a relatively narrow submarine plateau extends to the continental shelf, and then slopes very rapidly down to the great depths of the Pacific.

Vancouver Island is about 285 miles long, with an average width of about 60 miles. The most settled portions are the extreme south and the eastern coast from Victoria to, say, Comox. This portion of the Island also enjoys the best climate. The amount and distribution of precipitation varies from 30 inches annually at Victoria to about 45 inches at Campbell River, and renders irrigation, generally speaking, unnecessary. The summers are usually dry, with ample sunshine. The winters are not severe and have frequent periods of bright, sunshiny weather. The climate of this portion of British Columbia may be likened to that of the south coast of England. The whole of the western coast and most of the interior of Vancouver Island are regions of very heavy precipitation, probably averaging, over the greater part, upwards of 100 inches annually. The island is, for the most part, covered with a dense growth of large timber, while the undergrowth is the densest in the whole of Canada, and, in the summer, tropic-like in its abundance.

The coast of Vancouver Island is deeply indented with bays and arms of the sea, forming numerous deep-water harbours, thereby providing excellent shipping facilities for the mines, lumber mills, and other industries. Numerous lakes in the interior will provide local transportation routes for short distances, but the steams for the most part are not navigable save, to a limited extent, by canoe. The country on the southern and eastern coasts is comparatively level, while the interior is broken by mountains and heavily-wooded valleys. Much of the interior still remains practically unexplored and contains neither roads or railways. The greater portion of the agricultural land is covered with large trees and thick underbrush—but the quality of the soil well repays clearing where the timber is not too heavy, and where it may profitably be marketed.¹

¹The foregoing information on the topography of Vancouver Island is taken mainly from the Water Powers of British Columbia, by A. V. White; Commission of Conservation, Ottawa, 1919.

A LIST OF THE DERMAPTERA AND ORTHOPTERA RECORDED
FROM VANCOUVER ISLAND

DERMAPTERA

LABIDURIDAE

PSALINAE

- Anisolabis maritima* (Géné) (Introduced; established).
Euborellia annulipes (Lucas) (Introduced; established).

FORFICULIDAE

FORFICULINAE

- Forficula auricularia* Linnaeus. (Introduced; established).

ORTHOPTERA

BLATTIDAE

PSUEDOMOPINAE

- Blattella germanica* (Linnaeus) (Introduced; established).

BLATTINAE

- Blatta orientalis* Linnaeus (Introduced; established).
Periplaneta americana (Linnaeus) (Adventive).

PANCHLORINAE

- Panchlora cubensis* Saussure (Adventive; tropical).

ACRIDIDAE

ACRYDIINAE

- Acrydium granulatum* Kirby.

ACRIDINAE

- Stethophyma lineatum* (Scudder).

OEDIPODINAE

- Arphia pseudonietana* (Thomas).
Camnula pellucida (Scudder).
Dissosteira carolina (Linnaeus).
Trimerotropis pallidipennis pallidipennis (Burmeister).
Trimerotropis fontana Thomas.
Trimerotropis suffusus Scudder.

CYRTACANTHACRINAE

- Melanoplus bivittatus* (Say.)
Melanoplus femur-rubrum femur-rubrum (De Geer).
Melanoplus mexicanus bilituratus (Walker).

TETTIGONIIDAE

CONOCEPHALINAE

- Conocephalus fasciatus vicinus* (Morse).

DECTICINAE

Neduba carinata Walker.

STENOPELMATINAE

Stenopelmatus longispina Brunner.

RHAPHIDOPHORINAE

Tropidischia xanthostoma (Scudder).

Ceuthophilus agassizii (Scudder).

Pristoceuthophilus celatus (Scudder).

GRYLLIDAE

GRYLLINAE

Gryllus assimilis (Fabricius).

MYRMECOPHILINAE

Myrmecophila oregonensis Bruner.

In reviewing the above list of twenty-six species, we find that nineteen are native, while seven have been introduced.

Among these the three earwigs, and the German cockroach **Blattella germanica** (Linnaeus) have become firmly established; while a colony of the Oriental cockroach **Blatta orientalis** Linnaeus has been found in a bakery in Victoria. The remaining two species must be considered as purely adventive. The American cockroach **Periplaneta americana** (Linnaeus) has been taken out of doors in the City of Victoria but has not become established, while the Green Cuban cockroach **Panchlora cubensis** Saussure is a tropical species found in bunches of bananas.

In addition, seven other species which have been recorded from Vancouver Island are dealt with in footnotes as it is considered probable that these records are incorrect.

The systematic collecting of Orthoptera on Vancouver Island has never been seriously undertaken and it is probable that the present list does not comprise all the species present. In the high mountains, in the northern interior of the island, there are said to be many mountain valleys and open slopes rich in flowers where one might expect to find some of the brachypterous *Melanopli*; and in the dense, humid coastal forests, other species of **Ceuthophilus** and **Pristoceuthophilus** may be present. It is probable also that **Grylloblatta campodeiformis** Walker, closely allied to the orthoptera, would be found in the higher mountains, as it is known to occur in the coastal mountains of the adjacent mainland.

The writer has had the opportunity of a few days' collecting during the month of August on two occasions and made collections of orthoptera at short intervals from Victoria, on the southern extremity of the Island, up the east coast to Campbell River. North of this point there are neither roads nor railways, and heavy timber covers the land to the sea shore. There is no road system up the west coast but Alberni, and such points as are accessible by road were visited.

Speaking generally, one may say that the southern extremity of the Island south of latitude 49°—particularly the eastern portion—constitutes a dry-belt. During the summer months very little rain falls, and the hot sun and sea breezes dry out the soil and vegetation to a marked degree, and by the month of August grasslands are dry and brown. This condition exists, in the southeastern portion of the Island, in diminishing degree north to Qualicum. From this point to the mouth of Campbell River—on latitude 50°—only a narrow dry fore-shore separates the beach from the coniferous forest.

It is in the southeastern extremity of the Island that orthoptera are found most abundantly, and a short description of some of the main types of plant associations found here is of interest.

The shore line is mainly rocky, but here and there are extensive beaches of sand or pebbles. Immediately adjoining the shore there are, in many places, large open areas of rocky land with a shallow soil. Lichen and moss-covered outcroppings of rock are abundant, and the dry grassland is broken up by clumps of scrub-oak and broom, **Cytisus scoparius** Link. At some points on the east coast extensive saline flats occur; at other points wind-blown sand dunes. Further inland the conifers begin to mingle with, and soon replace, the deciduous trees.

In the neighbourhood of Nanaimo we find low, rocky, moss-clad hills, which, close to the shore, support a mixed stand of oak, **Quercus garryana** Dougl., arbutus, **Arbutus menziesii** Pursh., and broad-leaved maple. **Acer macrophyllum** Pursh. This association is found in no other part of Canada and is a strikingly beautiful and unexpected scene to anyone visiting Vancouver Island for the first time.

As one goes still further north the oak and arbutus rapidly disappear and the maple, mingled with alder and willow, are left, until all are crowded out by the conifers which approach the shore in increasing density and size as the rain belt of the central and northern sections of the island is reached in the vicinity of Campbell River. The dominant conifers are the Douglas Fir, **Pseudotsuga mucronata** Sudworth, western red cedar, **Thuja plicata** Don., western hemlock, **Tsuga heterophylla** Sargent, and the amabilis fir, **Abies grandis** Lindl.

The writer has made collections of orthoptera and studied their distribution and ecology for a number of years throughout the greater part of the mainland of British Columbia and while searching for orthoptera on Vancouver Island some interesting things were noticed. Possibly the most striking point was the absence of such species as **Chorthippus curtippennis** (Harris) and **Chrysochraon abdominalis** Thomas; the saline marshes and hay fields seemed ideal for the former; while the open woodlands appeared to be typical locations for the latter. The capture of **Stethophyma lineatum** (Scudder) in a small swamp near Cameron Lake was interesting, as this species is by no means common, and very local, in British Columbia.

In examining the distribution maps for British Columbian orthoptera we find that, with the exception of the capture of **Stethophyma lineatum** (Scudder) on Vancouver Island, there are no records of any of the fourteen species of Acridinae found in the Province from west of the Coast

mountains. Other points of interest are the extreme abundance of **Gryllus assimilis** (Fabricius) and the small size and brilliant colouration of some of the species; particularly so in regard to **Camnula pellucida** (Scudder.)

In the present paper a short synonymy is given under each species, comprising the original reference and the reference which, in subsequent literature, contains some points of interest in its life history, ecology or distribution. The synonymy is taken mainly from papers by Morgan Hebard to whom also—with J. A. G. Rehn—I am greatly indebted for much help in the determination of material and in matters of synonymy.

The keys which are included in this paper have been drawn up from the Vancouver Island material herein listed, in the hope that they may enable collectors on the Island to identify the species they may find. Unless otherwise stated, the characteristics used in the keys are taken from adult males of the species. In the formation of keys in this paper the Manual of the Orthoptera of New England by Morse, 1920, has frequently been followed.

KEY TO THE ORDERS OF ORTHOPTEROID INSECTS OF VANCOUVER ISLAND

- A. Abdomen of both sexes ending in a pair of conspicuous, horny, unjointed pincers or forceps-like appendages. Tarsi three-jointed. The three pairs of legs similar in form and nearly equal in length. Wings, if present, folded transversely as well as radially and hidden, save at tips, under leathery tegmina without veins, which meet in a straight line down the back.

Order **DERMAPTERA**. *Earwigs*.

- AA. Abdomen without forceps-like appendages at end. Wings, if present, folded in fan-like plaits to their base and covered more or less completely by stiffer, parchment-like, thickly veined, overlapping tegmina.

Order **ORTHOPTERA**. *Roaches, grasshoppers, crickets*.

Order **DERMAPTERA**. The *Earwigs*.

Three species of earwigs are at present known from Vancouver Island and the following key may be of aid in separating them. No native earwig has been recorded.

KEY TO SPECIES OF VANCOUVER ISLAND DERMAPTERA

- A. Without trace of tegmina or wings.
- B. Legs yellowish, not banded with black; antennae 20-24 jointed. Large species confined to sea-shore; 20-28 mm. in length.
Maritime earwig, *Anisolabis maritima* (Géné)
- BB. Legs yellowish, usually distinctly banded with black on femur and tibia, antennae 15-16 jointed. Medium size, 12-16 mm. in length.
Ring-legged earwig, *Euborellia annulipes* (Lucas)

AA. Tegmina and wings present.

B. Stout species, tegmina and wings well developed; forceps stout, of male dimorphic; calliper-like. Length 16-23 mm.

European Earwig, *Forficula auricularia* Linnaeus.

Family LABIDURIDAE

Subfamily PSALINAE.

Anisolabis maritima (Géné) The Maritime Earwig.

1832—*Forficula maritima* Gén , Ann. Sci. de Regno Lombardo—Veneto, Padova, Vol. 2, p. 215.

1929—*Anisolabis maritima* (G n ) Buckell, Proc. Ent. Soc. B.C. p. 13.

Forficelisa maritima Serville and *Brachylabis maritima* Dohrn are synonyms.

Localities: Departure Bay, Nanaimo.

This large earwig is a comopolitan species of world-wide distribution, its range having undoubtedly been widely extended by commerce. It has been recorded from North America, Mexico, Bermuda, Ecuador, Canary Island, West Indies, Japan, New Zealand, and probably occurs at many other points. In North America it has been recorded on the Atlantic coast from Maine to Texas, and on the Pacific coast in British Columbia.

This earwig was first recorded from Canada by Professor G. J. Spencer², who took it in considerable numbers on a small island three miles out from Departure Bay, Nanaimo, and on the mainland of Vancouver Island just near the Biological Station. It was discovered at the end of May, 1926, in coarse gravel at high tide mark, living in a narrow belt some two feet wide where the water had deposited a strip of seaweed and flotsam. The insects seemed restricted to this narrow, damp belt, hiding under logs or masses of dead seaweed or burrowing down into the gravel.

The author has since collected several hundred specimens at Departure Bay and found them restricted to the seaweed belt, as did Professor Spencer.

In early June, 1928, Mr. Arthur Gibson, Dominion Entomologist, and Mr. W. Downes, of the Victoria Entomological Laboratory, found many specimens in this locality in all stages of development, and in August the author found at least 75% still immature.

The collection of adults showed that males were scarce, the females outnumbering them by ten to one. Two females were found in damp sand beneath a log in large flat cells; one was guarding a pile of sixty-five oval yellowish white eggs, and the other a newly hatched brood of young. They are not known to occur at any other point on the coast

²Spencer. Can. Ent. Vol. 58, No. 8, p. 183, 1926.

of Vancouver Island or on the mainland of British Columbia at the present time. They were probably introduced to Departure Bay by Japanese fishing boats, as there is a considerable trade in herrings from this point to the Orient.

An interesting paper on the habits of this species, by C. B. Bennett³ appeared in *Psyche*, from which the following account has been condensed:—

The colony of Maritime earwigs, from which these observations were made, were found near Cold Spring Harbour, N.Y.

Eggs were laid mainly in the warmer months of July and August and only a very few after the middle of September. After about seventeen days—although the time varied with varying conditions of temperature, humidity, etc., the young emerged from the egg.

Female adults are, as a rule, longer and otherwise larger than the males. The size of the full-grown insects which I have seen varied from 16mm. to nearly 35 mm. The females were three or four times as numerous as the males. These earwigs seem to be capable of great endurance. They are accustomed to live near water, and when disturbed they frequently enter the water, and when frightened, would crawl to the underside of some floating objects and hide themselves under water. One was observed to remain submerged for 65 minutes without harm. They easily succumb to lack of water; if kept in a dry place they soon die.

These earwigs are at least partly carnivorous, and any insects not protected by too tough a covering will serve them as food; they probably act as scavengers on the shore. When walking over wet ground, the earwig so twists its heavy abdomen that the narrow side rather than the flat bottom would come in contact with the ground and thus serve as a runner to support its weight

As already mentioned above, the Maritime earwig makes free use of its forceps in defending itself and also offensively in securing and holding its prey. A very severe nip can be given the finger by a large male of this species, the pressure applied being truly remarkable for so small an insect.

The Maritime earwig is an adventive species which seems to have become firmly and permanently established at Departure Bay, Nanaimo, on the east coast of Vancouver Island. From this point it will probably be spread to other points on the coast of British Columbia. From its restricted habitat it is never likely to become of economic importance to mankind.

Euborellia annulipes (Lucas) the Ring-legged Earwig.

1847—*Forficelisa annulipes* Lucas, Bull. Soc. Ent. France (2), V. p. 84.

1929—*Euborellia annulipes* (Lucas) Buckell, Proc. B.C. Ent. Soc., p. 16.

³Bennett. *Psyche*. Vol. II, p. 47, 1904.

Synonyms are:—*Forficula annulipes* Fischer, *Forcinella annulipes* Dohrn, *Anisolabis annulipes* Brunner (Burr gives the following synonyms: *bormanisi*, Scudder; *antoni*, Dohrn; *antennata*, Kirby; *annulicornis*, Blanchard; *annulicornis*, Blanchard; *variicornis*, Smith; *aporonoma*, Borelli.)

Localities: Victoria.

This is a cosmopolitan species widely distributed by commerce. It has been recorded from France, Italy, England, North America, Mexico, Bermuda, Brazil, Paraguay, Guatemala, Guadeloupe, Trinidad, Cuba, Hawaii, Ceylon, Algeria, and probably occurs in many other countries.

In North America adventive material has been recorded from Massachusetts, Connecticut, Pennsylvania, and the District of Columbia, and it is said to be established along the coast from North Carolina to Texas. On the Pacific Coast it occurs fairly commonly on the coast of Southern California and at Victoria on Vancouver Island, British Columbia.

The first record of this species for Canada was in 1916 when two specimens of this earwig were taken on board ship in Vancouver docks by Treherne⁴. Since that date a colony has been found, which seem to be well established, in the gardens of the Empress Hotel in Victoria. This colony has been under observation since 1927. They are found mainly in the gardener's sheds and refuse heaps.

This species is not restricted to the sea shore like the preceding species, but may occur further inland. It is found usually beneath rubbish in both dry and damp situations. It is not known in any other locality in Canada, as far as I am aware, but can be considered as an established adventive in Victoria, British Columbia. It is not, however, likely to become of economic importance in Canada.

Family FORFICULIDAE.

Subfamily FORFICULINAE.

Forficula auricularia Linnaeus. The European Earwig.

1758—*Forficula auricularia* Linnaeus. Syst. Nat., ed. 10. Vol. 1, p. 423.

1929—*Forficula auricularia* Linnaeus. Buckell. Proc. B.C. Ent. Soc., p. 20.

Synonyms are:—"F. major. De Geer, F. dentata Fabr., F. parallela Schm. and F. lurida Fisch. F. neglecta Marsham is an ordinary female; F. media Marsham is F. auricularia with rather longer callipers than those of the usual form; F. borealis Steph. has still longer callipers; F. forcipata Steph. has very long callipers."⁵

Localities: Victoria and Alert Bay.

The European earwig is found commonly in England, France, Holland, Norway and Germany, and has been carried by commerce to North America, South America, New Zealand, Tasmania, North Africa, West-

⁴Treherne took two specimens on the SS. Talthybius—a blue Funnel Liner—in Vancouver docks in Feb., 1916.

⁵Lucas. Brit. Orth., p. 40, 1920.

ern Asia, Cuba and Madeira. It is liable to occur wherever steamships ply regularly from European ports.

Adventive specimens of this cosmopolitan species have been recorded a number of times from the eastern United States, but it did not become established until about 1912, when a colony appeared at Newport, Rhode Island, which was first reported by Glaser.⁶ Blatchley⁷ records that this species increased so rapidly at Newport and threatened to become such a pest that a special bulletin⁸ treating of it was prepared and issued by the U.S. Bureau of Entomology. It has also been found in numbers at East Aurora, N.Y.

On the Pacific Coast it has now become firmly established and is a serious garden and household pest. Fulton⁹ states that: "Records show that the earwig has been present in Oregon since 1909. A specimen which was identified as an earwig was sent to this Experiment Station in 1910 from Albany, Oregon, accompanied by a letter in which the writer claimed that the insect had been a pest during the previous summer also. Little more was heard of the earwig until 1915, when it attracted much attention in Seattle, Washington, by its numbers and disagreeable habits. Afterwards, letters from both Portland and Albany, Oregon, began to call attention to the pest. By 1919 it had become established in Vancouver and New Westminster in British Columbia. In 1923 the earwig was known to occur in the following locations: Astoria, Salem, Eugene, Corvallis, Forest Grove, Gresham, Roseburg, Dayton, Mill City, Cotton and Blodgett, in Oregon; Vancouver, Camas and Anacortes, in Washington; and Berkeley, in California."

In British Columbia the earwig is now recorded from all over Vancouver, New Westminster, and adjoining municipalities. It is also established on Vancouver Island in the district of Victoria, and I have seen specimens from as far north as Alert Bay on the northeast coast of Vancouver Island.¹⁰

Order **ORTHOPTERA.**

On Vancouver Island four families of the order Orthoptera are found, *viz.*, the Blattidae, belonging to the non-saltatorial Orthoptera, and the Acrididae, Tettigoniidae and Gryllidae, belonging to the saltatorial Orthoptera.

KEY TO THE FAMILIES OF VANCOUVER ISLAND ORTHOPTERA.

- A. Legs equal or nearly equal in size, the hind thighs not distinctly enlarged for leaping. Auditory and sound-producing organs absent. Tegmina and wings in later nymph stages, when present, in normal position. Ovipositor not conspicuous.

Non-saltatorial Orthoptera

⁶Glaser. Psyche. Vol. 21, No. 5, p. 157, 1914.

⁷Blatchley. Orth. N.-east Amer., p. 57, 1920.

⁸Jones. Bull. 566, U.S. Dept. Agric., June 18, 1927.

⁹Fulton. Bull. 207, Oreg. Ag. Coll., 1924.

¹⁰*Labia minor* (Linnaeus) has not as yet been recorded from Vancouver Island although it is probably present.

- B. Body strongly depressed; broad, more or less oval in outline. Head nearly or quite concealed by pronotum, the face ventral, the mouth posterior. Pronotum shield-shaped. The three pairs of legs much alike.

Cockroaches, Family *Blattidae*.

- AA. Hind legs elongate, the thighs enlarged for leaping. Auditory and sound-producing organs usually present. Tegmina and wings in later nymph stages, when present, reversed in position. Ovipositor usually conspicuous.

Saltatorial Orthoptera.

- C. Antennae shorter than the body, of varied form. Ocelli present. Tarsi usually three jointed. Auditory organs at sides of base of abdomen. Stridulation produced (in large part) by rubbing the hind thighs against the tegmina. Ovipositor composed of a dorsal and ventral pair of short curved pieces moving vertically, with acutely pointed, divergent tips . . . True Locusts, Short-horned Grasshoppers, Family *Acrididae*.
- CC. Antennae much longer than the body, bristle-shaped, delicately tapering. Tarsi-three or four-jointed. Ovipositor, usually prolonged and compressed, blade-like, or cylindrical and needle-like in form. Auditory organs situated near base of front tibiae, stridulating organs on dorsal field of tegmina.
- D. Tarsi four-jointed. Ocelli usually absent. Tegmina sloping at the sides of the body (except a small area near the base in male.) Ovipositor compressed, blade-like, the tip not enlarged.
Katydid, Long-horned Grasshoppers, Cave-crickets, Family *Tettigoniidae*.
- DD. Tarsi three-jointed. Ocelli variable. Tegmina flat above, bent abruptly down at the sides in both sexes. Ovipositor usually visible as a cylindrical, straight, or up-curved needle-like organ, the tip very slightly enlarged.

Crickets, Family *Gryllidae*.

Family BLATTIDAE. The Cockroaches.

Four species of cockroaches have been recorded from Vancouver Island, two of which have become established. Of these the German roach is permanently established, and the Oriental roach temporarily and possibly, permanently, established. There are no native cockroaches on Vancouver Island.

KEY TO THE SPECIES OF VANCOUVER ISLAND BLATTIDAE.

- A. Prevailing colours light yellowish—to dark chestnut-brown.
- B. Tegmina extending to or projecting beyond end of abdomen.
- C. Small species. Dull yellowish-brown, the females oftener darker; disc of pronotum with two dark brown, longitudinal stripes separ-

ated by a yellowish one; antennae dark brown, exceeding slightly the tips of the closed tegmina. Tegmina and wings of male extending to end of abdomen, those of female slightly longer. Length 11-12 mm.

German Roach, *Blattella germanica* (Linnaeus.)

- CC. Large species. Shining reddish-brown; pronotum broadly margined on sides and base, and narrowly in front with yellow, this enclosing a large, bilobed brown spot which is usually sharply defined; antennae brown, greatly exceeding the tips of the closed tegmina. Tegmina in both sexes extending much beyond end of abdomen. Length 29-35 mm.

American Roach, *Periplaneta americana* (Linnaeus.)

- BB. Tegmina covering not more than three-fourths of abdomen.

- D. Medium size. Nearly uniform, shining dark chestnut brown. Tegmina of male covering about two-thirds of abdomen; in female represented by small oval, widely separated pads. Length 18-24 mm.

Oriental Roach, *Blatta orientalis* Linnaeus.

- AA. Prevailing colour, pale green.

- E. Medium size, rather slender, structure delicate. Uniform pale green above; occiput, pronotum and tegmina with a yellowish-white sub-marginal line. Length 12-18 mm.

Green Cuban Roach, *Panchlora cubensis* Saussure.

Subfamily PSEUDOMOPINAE.

Blattella germanica (Linnaeus) The German Roach.

1767—*Blatta germanica* Linnaeus, Syst. Nat., Ed. 12, p. 638 (Denmark.)

1917—*Blattella germanica* (Linnaeus) Hebard, Mem. Amer. Ent. Soc., No. 2, p. 57.

Established synonyms are:—*Blatta obliquita* Daldorff and *Ischnoptera bivittata* Thomas.

Localities. Victoria.

This small cockroach is a cosmopolitan species, probably of European origin, which has been spread by commerce to many parts of the world. It is mainly a domiciliary pest found principally in restaurants, hotels and on ships. It is able to live in the open in Canada only in large refuse heaps, such as are found on the outskirts of cities. One such colony has, to the writer's knowledge, lived through very severe cold spells in the city refuse heap at Vernon, British Columbia, where winter temperatures sometimes drop to twenty-five degrees below zero. This colony doubtless finds sufficient warmth in the heart of the refuse heap, even in such severe weather, to survive the winter months.

The German roach has been recorded from Alaska, the Yukon and British Columbia eastward across Canada to Nova Scotia and there are probably few cities in North America which do not harbour this little cockroach.

The objectionable habit of running over our food at night in pantries and restaurants, and its possible association with the spread of disease, makes the German cockroach a household pest of considerable economic importance.

Subfamily BLATTINAE.

Blatta orientalis Linnaeus. The Oriental Roach.

1758—*Blatta orientalis* Linnaeus. Syst. Nat., Ed. X. 1, p. 424. (America the East; Russia; Stockholm; Sweden; Finland.)

1917—*Blatta orientalis* Linnaeus. Hebard. Mem. Amer. Ent. Soc., No. 2, p. 173.

Established synonyms are:—*Blatta culinaria* De Geer, *Blatta ferrugineofusca* Gronov and *Blatta badia* Saussure.

Localities. Victoria.

The Oriental cockroach has been recorded on Vancouver Island from Victoria where a colony is known to exist in a bakery. As far as I am aware this is the first time it has been found in Canada as an established colony. Specimens have been found, generally in bunches of bananas, in Vancouver and Metlakatla near Prince Rupert, in British Columbia; Winnipeg, Manitoba; Hamilton, Toronto, Sarnia and Ottawa, Ontario; in the City of Quebec; and on Sable Island, Nova Scotia.

Hebard¹¹ states: . . . "This is a medium large, blackish brown insect the males of which have the tegmina falling short of the apex of the abdomen, while in the females these organs are represented by small, ovate-lanceolate, lateral pads. . . . This cosmopolitan domiciliary pest has been spread by commerce over all but the most northern portions of the United States. . . . As is the case with *Blattella germanica*, its greatest abundance on this Continent appears to be reached in the central latitudes of the United States."

This roach is very gregarious, and delights in damp, dirty basements and cellars. At night, when all is dark and quiet, they invade larders and kitchen cupboards and will eat all kinds of foodstuffs and also such things as ink, blacking and the film from photographic plates. If they get access to human food, they spoil everything they come in contact with, owing to the disgusting odour they leave behind them. In their favour it may be said that they are great scavengers and an enemy of the bed-bug.

Periplaneta americana (Linnaeus) The American Roach.

1758—*Blatta americana* Linnaeus. Syst. Nat. Ed. X. p. 424 (Amer.).

¹¹Hebard. Mem. Amer. Ent. Soc., No. 2, p. 174, 1917.

1917—*Periplaneta americana* (Linnaeus) Hebard. Mem. Amer. Ent. Soc., No. 2, p. 178.

Established synonyms are:—*Blatta kakkerlac* De Geer, *Blatta aurelianensis* Fourer, *Blatta siccifolia* and *aurantiaca* Stoll, *Periplaneta stolidus* Walker and *periplaneta americana* variety *colorata* Rehn.

Localities. Victoria.

This large, reddish-brown cockroach, a native of tropical and subtropical America, has, like the Oriental roach, spread to the four corners of the earth.

It has been recorded from Victoria and Vancouver, British Columbia, Kitchener and Ottawa, Ontario, and Montreal, Quebec. "In the United States it is certainly established further north than any of the other species of the genus, but, as it is being continually transported by commerce beyond its native northern limit, it is a difficult matter to state just how far northward it is permanently established. In the more northern states, however, we feel certain that records of the insect should be considered as adventive. It is undoubtedly firmly established as far northward as New York City. South of the United States the species is found generally over the continent and adjacent islands."¹²

The specimens taken in Victoria and elsewhere in Canada must be considered as purely adventive material. The American cockroach, throughout its range, is domiciliary and lives in close association with man.

Subfamily PANCHLORINAE.

Panchlora cubensis Saussure. The Green Cuban Roach.

1862—*Panchlora cubensis* Saussure. Rev. et Mag. de Zool. (2), XIV, p. 230. (Cuba).

1917—*Panchlora cubensis* Saussure. Hebard. Mem. Amer. Ent. Soc., No. 2, p. 198.

Localities. Victoria and Duncan.

This tropical roach has been recorded from British Columbia from Kaslo, Vernon, Lillooet and Vancouver in addition to the above localities. Other Canadian records are Winnipeg, Manitoba; Saskatoon, Saskatchewan; Ottawa, Ontario; and Charlotte Town, Prince Edward Island.

Hebard gives the following information in regard to the synonymy and distribution of the species.¹³

"Though many names now standing in the literature represent almost certainly synonyms of this species, examination of the types of at least several of these, must be made before the nomenclature of the plain green species of the genus can be put on a secure basis.

¹²Hebard. Mem. Amer. Ent. Soc., No. 2, p. 181, 1917.

¹³Hebard. Mem. Amer. Ent. Soc., No. 2, p. 198, 1917.

"The present species is widely distributed throughout the greater Antilles, Mexico and Central America, its distribution extending within the limits of the United States only in the vicinity of Brownsville, Texas. The insect is frequently shipped alive into the United States, particularly in bananas, but it is an essentially out-of-doors tropical form and can never become established north of the tropical areas of this country."

Of the seven species of insects so far dealt with in this paper, i.e., the three earwigs and the four cockroaches, none can be considered to be native species, although, through the agency of man, some have become firmly established. The following eighteen species of orthoptera, however, can all be considered as native.

Family ACRIDIDAE. True Locusts, Short-horned Grasshoppers.

The four subfamilies of the Acrididae which are found on Vancouver Island contain the best known grasshoppers of the Island. All are native species.

KEY TO THE SUBFAMILIES OF VANCOUVER ISLAND ACRIDIDAE.

- A. Pronotum covering and extending well beyond end of abdomen in Vancouver Island species. Claw-pads absent. Front and middle tarsi two-jointed, hind tarsi three-jointed.
Pigmy Locusts, *Acrydiinae*.
- AA. Pronotum of normal size, not covering the abdomen. Claw-pads (pulvilli) present between the tarsal claws. All tarsi three-jointed.
 - B. Prosternum not spined—flat, convex, or at most with an obtuse tubercle.
 - C. Hind margin of pronotum not or but little produced—truncate, convex, or very obtusely angulate. Disc of pronotum without high median carina. Face retreating, and angulate at junction with vertex.
Slant-faced Locusts, *Acridinae*.
- CC. Hind margin of pronotum strongly produced—acute, right-angled or nearly so. Pronotum usually with distinct median keel. Face usually nearly vertical, and rounded at meeting with vertex.
Band-winged Locusts, *Oedipodinae*.
- BB. Prosternum with a prominent conical or cylindrical spine projecting ventrad to the level of the distal end of the coxa.
Spine-breasted or Spur-throated Locusts, *Cyrtacanthacrinea*.

Subfamily ACRYDIINAE. Pigmy Locusts.

Only one species of Pigmy Locust is known from Vancouver Island. ***Acrydium granulatum*** Kirby. Angular Pigmy Locust.

1837—*Acrydium granulatum* Kirby. Fauna Boreali—Amer. IV. p. 251, (Lat. 65' Br. Amer.).

1920—*Acrydium granulatum granulatum* Kirby. Morse. Proc. Boston Soc. Nat. Hist., XXXV, p. 530.

Hancock's *Tettix luggeri*, *morsei* and *granulatus variegatus* are synonyms.

Localities. Sidney and Victoria.

This little pigmy locust is found throughout British Columbia from east to west and from north to south and occurs also in the Yukon and the B.C. Peace River District. It is one of the most universally distributed grasshoppers that we have. Its small size and protective colouration, however, cause it to be seldom noticed except by collectors. On Vancouver Island it does not seem to be at all common and one or two specimens from the two localities given above are all that have been recorded from the Island so far.

In Canada it is common from B.C. to Nova Scotia and in the United States it has been recorded from all the northern and central states down to the latitude of Utah, Colorado, Kansas, Indiana and New Jersey.

It is a beautiful little grasshopper with very variable colouration usually wholly grayish or reddish-brown, sometimes blackish; pronotum often with a median yellowish band along the full length, rarely with irregular brown or black spots preceded by a white or cream coloured saddle-like marking. The pronotum is very long in this species, extending back and passing the hind femora. There is a form of this species with a much shorter pronotum. The length of the common form is 10-15 mm.

Hancock¹⁴ states that . . . "Many if not all the species of Tettigidae in the temperate region hibernate, secreting themselves among débris such as dead leaves, twigs, mosses, grasses, as well as under logs and bark, and in the little crevices in the earth where they happen to be late in the fall of the year. They live on the ground, usually near water, either in boggy places, along the banks of streams, the shores of small lakes or swamps, in woods, or more rarely on dry upland ground. They feed upon the vegetable mould or decomposing soil, sometimes mixed with algae, or on the lichens, mosses, tender sprouting grasses, sedges, germinating seeds of plants and débris found in such situations."

Acrydium granulatum flies freely in the sun and, hibernating as an adult, is the first grasshopper to appear in spring. Their leaping powers are amazing, and on dry leaves they sound like falling shot when they land, and are extremely hard to detect when at rest upon the soil or leaves.

Subfamily ACRIDINAE. Slant-faced Locusts.

This subfamily is the Tryxalinae of authors. On Vancouver Island only one species of this subfamily has as yet been recorded although at least sixteen species occur on the mainland of British Columbia to the east of the Coast Mountains.

¹⁴Hancock. The Tettigidae of North America, 1902.

Stethophyma lineatum (Scudder) Striped Sedge-Locust.

1862—*Arcyptera lineata* Scudder, Boston Jour. Nat. Hist., Vol. 7, p. 462.

1920—*Mecostethus lineatus* (Scudder) Morse, Proc. Boston Soc. Nat. Hist., XXXV., p. 442.

Localities. Cameron Lake.

This species occurs locally throughout British Columbia and is probably more widely distributed than the actual records show as they are very restricted in habitat. Material has been collected at Nicola, Aspen Grove and Minnie Lake in the Nicola Valley; at Salmon Arm; and at Riske Creek in the Chilcotin district. It is recorded in every province in Canada from British Columbia to Nova Scotia and also from Newfoundland. In the United States it is found in New England to New Jersey, Pennsylvania, Indiana, Illinois, Michigan, Iowa, Minnesota, Nebraska, and from the State of Washington.

While collecting orthoptera on Vancouver Island the author took three males of this species in a small swamp near Cameron Lake on August 28th, 1928. This was the first record of any member of the sub-family Acridinae from Vancouver Island; in fact, none have been recorded from west of the Coast Mountains.

This is one of the most beautiful orthoptera that we have; its greens and yellows being set off by bright cherry-red markings on the basal two-thirds of the hind femora.

This elegantly formed, brilliantly coloured locust is found in wet, sedgey meadows along brooks and rivers, and in swamps and bogs where water stands upon the ground for days at a time.

The males are very shy and alert, and will take wing from the tops of the sedges and tall grasses when the intruder is many yards away. They take wing suddenly and silently, flying steadily at a little height above the sedges for twenty yards or more before alighting on some tall grass stem. Sometimes they will remain on the plant stems on the opposite side to the intruder and descend backwards in a series of jerks and disappear amongst the thick grasses on the ground, where they are very hard to find. The female is much heavier than the male and rarely flies.

On warm days the males may be located in the swamps by their "song" which consists of four sharp metallic notes, with a pause after the first and third note . . . tick,-tick tick,-tick. This song is easily distinguishable from that of their near relative *Stethophyma gracile* (Scudder) whose bird-like "song" consisting of a low-toned note followed after a short pause by three quicker notes in a higher pitch—resembling—schirrup,-schlip-schlip-schlip. I have found by dissection that about twenty-one eggs are laid at one time, but egg-pods have not been seen in the field; they are probably laid in the drier soil bordering the swamps in which the locusts live. It has been noticed that females are more often found in drier situations than the male.

Subfamily OEDIPODINAE. The Band-winged Locusts.

It is in this subfamily that all the Vancouver Island grasshoppers having brightly coloured wings belong. Six species of this subfamily are recorded for the Island and all but one have yellow and black or red and black wings, and most of them can produce buzzing, rattling or snapping sounds in flight.

KEY TO THE SPECIES OF OEDIPODINAE OF VANCOUVER ISLAND.

- A. Wings black with a pale border. Caroline Locust, *Dissosteira carolina* (Linnaeus.)
- AA. Wings not black.
 - B. Wings entirely transparent. Clear-winged Locust, *Camnula pellucida* (Scudder.)
 - BB. Disk of wings opaque, colored (red or yellow) plainly bounded by a black band.
 - C. Disk of wings red; bounded by a black band. Autumn Red-winged Locust, *Arphia pseudonietana* (Thomas.)
 - CC. Disk of wings yellow.
 - D. Hind tibiae blue or bluish-black, with pale sub-basal annulus; tibiae never yellow.
 - E. Wings narrow. Disk of wings pale yellow; dusky band narrow, extending near front margin two-thirds the distance to base of wing. Tip of wing infuscated. Tegmina and hind femora banded.
Trimerotropis fontana (Thomas.)
 - F. Wings broad. Disk of wings deep lemon yellow; dusky band broad; whole extremity of wing deeply infuscated. Tegmina not banded.
Snapping Locust, *Trimerotropis suffusus* Scudder.
 - DD. Hind tibiae yellow or yellowish brown; never blue. Disk of wings very pale yellow; dusky band dark and broad and extending near front margin less than two-thirds of distance to base of wing. Tip wing not infuscated.
Trimerotropis pallidipennis pallidipennis (Burmeister.)

Arphia pseudonietana (Thomas) Autumn Red-winged Locust.

1870—*Tomonotus pseudo-nietana* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 82 (♂; near Canon City, Colorado).

1914—*Arphia pseudonietana* (Thomas.) Somes, Univ. of Minnesota. Agr. Exp. Sta. Bull. 141, Tech., p. 36.

Established synonyms are:—*Arphia tenebrosa* Scudder, *sanguiniaria* Stal, *ovatriceps* Saussure and *Tomonotus theresiae* Brunner.

Localities. Victoria.

This pretty red-winged grasshopper is very common in the vicinity of Victoria in late August and throughout September. It is particularly common on the dry grass-lands adjoining the shore at Oak Bay.

Suitable localities for this species are to be found on the east coast from Victoria to Campbell River but so far no records are available north of the Saanich Peninsula. The writer searched carefully for this species but failed to find a single specimen north of the areas mentioned and is unable to explain its restricted area of distribution on the Island.

On the mainland of British Columbia it is a common species and has been recorded from Vancouver to Creston and north throughout the interior plateau to Willams Lake and Riske Creek in the Chilcotin district. At the present time I have no records of its occurrence in British Columbia east of the Selkirk mountains or north of the Chilcotin district, although I am not satisfied that it does not occur there.

In Canada this species has been recorded from British Columbia to Ontario.

In the United States this species occurs throughout the Great Plains and eastern portions of the Great Basin, its distribution being bounded by Washington, Oregon, Utah, Arizona, New Mexico, Kansas, Missouri, Illinois and Michigan.

Arphia pseudonietana is found on areas of poor soil in a dry environment, such as dry pastures and the fore-shore such as is found at Oak Bay.

This is one of our latest grasshoppers to become adult and lives on late into the autumn. The females are larger than the males, less active, and often of lighter colouration; some specimens being found with a chalky-white pronotum and two or three white bands across the top of the hind femora. The prevailing colour of both sexes is dark blackish-brown with black speckles.

This grasshopper flies with a rather slow zigzag flight and both sexes can produce, at will, a slow low-toned rattling noise when on the wing. Oviposition commences in the last week in August, and about twenty eggs are contained in an egg-pod.¹⁵

Camnula pellucida (Scudder.) The Clear-winged Locust.

1862—*Oedipoda pellucida* Scudder, Boston Jour. Nat. Hist., VII., p. 472. (♂; Massachusetts; Vermont; Maine; Connecticut).

1920—*Camnula pellucida* (Scudder) Blatchley, Orth. of North-eastern America, p. 261.

Synonyms are:—*Oedipoda atrox* Scudder, *Camnula tricarinata* Stal and *Stenobothrus obionus* Thomas.

¹⁵The previously published records of *Arphia frigida* Scudder and *Chortobhaga viridifasciata* (De Geer) for Vancouver Island are almost certainly errors due to incorrect labelling. The specimens were probably collected in south-eastern British Columbia in the Kootenay Valley between the Selkirk and Rocky Mountain Ranges.

Localities. Victoria, Ladysmith, Departure Bay, Qualicum, Duns-muir, Fanny Bay, Campbell River, Cameron Lake, Alberni, Sproat Lake, Sidney.

This species is the only member of the subfamily *Oedipodinae* found on Vancouver Island which does not have coloured wings. It occurs in small numbers on all open dry spots such as dry pastures and the dry fore-shores along the coast.

On the mainland of British Columbia it is one of our commonest species and has been taken wherever collecting has been done and extends at least as far north as the B.C. Peace River district.

In Canada it is a common species from British Columbia to Nova Scotia and occurs also in Newfoundland.

In the United States its southern limits are northern Connecticut, northern Indiana, northern Illinois, western Nebraska, Utah and California, west of the Sierra Nevada to the Mexican Line. Its distribution is carried south by the Appalachian Mountains to Monterey in Virginia, while it is known through the Rocky Mountains to Valencia County in New Mexico and is found on the Arizona Plateau.¹⁶ It is, however, probably absent from the Southern Great Plains.

This species is known in various parts of North America as the range grasshopper, roadside grasshopper, or warrior grasshopper, and is one of the most widely distributed and most injurious of North American grasshoppers. On Vancouver Island it is smaller than on the mainland and those found close to the sea are often very brightly coloured.

On the mainland of British Columbia this species flourishes on the higher cattle ranges of the Nicola and Chilcotin districts where it periodically increases to immense numbers and destroys grass and grains over wide areas. It congregates in chosen spots for oviposition and the writer has found some of these egg-beds to contain as many as 2500 eggs per square foot of soil. The eggs are laid in egg-pods containing from 12 to 28 eggs. On hatching the nymphs keep together in bands and, like the adults, show decided migratory tendencies, similar to those exhibited by the migratory grasshoppers or "locusts" of Africa and Asia. In the Nicola Valley, the flying swarms of adults have been known to descend upon and entirely destroy fields of growing grain in one day.

On Vancouver Island there is not sufficient dry open grassland to enable this species to increase to injurious numbers.

Dissosteira carolina (Linnaeus.) The Carolina Locust.

1758—*Gryllus carolinus* Linnaeus, Syst. Nat., Ed. X., p. 433 (America),

1920—*Dissosteira carolina* (Linnaeus). Morse, Proc. Boston Soc. Nat. Hist. XXXV., p. 465.

¹⁶Hebard. The Orthoptera of Montana. Proc. Acad. Nat. Sci. Phila., Vol. LXXX., p. 236, 1928.

¹⁷Hebard. The Orthoptera of South Dakota. Proc. Acad. Nat. Sci. Phila., Vol. LXVII, p. 76, 1925.

Localities. Victoria.

As far as present records go, this large, black-winged grasshopper occurs mainly on the upper shore line amongst the patches of sand and rocks and on the low cliffs from Beacon Hill Park to Oak Bay, Victoria. They are found in small colonies and cannot be considered a common species on the Island.

The distribution of this large conspicuous grasshopper on the mainland of British Columbia is a rather curious one. It is usually found within city limits, where it frequents the roads, vacant lots and railroad tracks. In examining distribution maps it is found that it has never been taken as yet in any part of the province to the north of the main line of the Canadian Pacific Railroad, and its distribution is confined to points along this railroad from Vancouver to Sicamous and thence south to Osoyoos and at two points on the Kettle Valley Railroad at Creston and Cranbrook.

In Canada it has been recorded from every province from British Columbia to Nova Scotia, but its distribution within these provinces is confined to their southern portions.

In the United States the species enjoys an unusually wide and general distribution from all but the more boreal portions of New England to northern Florida and westward to the Pacific coast. It has not been found, except in the mountains, south of northern New Mexico, Arizona and California.¹⁸

This species appears late in the summer. Its large wings rustle audibly as it skips along in flight ahead of an intruder. The males will sometimes hover at one point in the air and omit a weak squeaking sound with their wings.

Trimerotropis pallidipennis pallidipennis (Burmeister).

1838—*Oedipoda pallidipennis* Burmeister, Handb. Ent., II., Abth. II., pl. 1, p. 461. (Zimapan in Mexico).

1876—*Trimerotropis vinculata* Scudder. Scudder Proc. Boston Soc. Nat. Hist., XVIII, p. 270.

1928—*Trimerotropis pallidipennis pallidipennis* (Burmeister). Hebard, Proc. Acad. Nat. Sci. Phila., LXXX, p. 253.

An established synonym is *Trimerotropis vinculata* Scudder.

Localities. Victoria, Qualicum, Dunsmuir, Fanny Bay.

This grasshopper occurs on sand dunes and dry gravelly flats and amongst drift-wood areas along the sea shore, and was found to be fairly common in such localities at Qualicum Beach and Fanny Bay. The Vancouver Island specimens are smaller and paler than those of the mainland. The females greatly exceed the males in size. The flight of the female is erratic and silent; the male can, at will, produce a measured creaky zid-zid-zid-zid while in flight. They rise rapidly from the ground, which they closely resemble, and are hard to capture.

¹⁸Hebard, Orthoptera of South Dakota. Proc. Acad. Nat. Sci. Phila., Vol. LXVII., p. 81, 1925.

This geographic race occurs fairly commonly on sandbars and gravel patches on the shores of lakes and streams and on dry, poor soil, throughout southern British Columbia and at least as far north as the Chilcotin District.

In the United States, according to Hebard,¹⁹ typical *pallidipennis pallidipennis* occurs from Washington to far south in Mexico. Its eastern limits are Montana, Colorado and Texas. It also occurs in South America.

In southern Alberta, Saskatchewan and Manitoba, and in the Dakotas, Nebraska and Oklahoma this race is replaced by *pallidipennis salina* McNeill.

Trimerotropis fontana Thomas.

1876—*Trimerotropis fontana* Thomas, Proc. Davenport Acad. Sci., 1 p. 255. pl. 36 fig. 5 (♂, ♀; Spring Lake in Utah).

1881—*Trimerotropis caeruleipes* Scudder, 2d Rept. U.S. Ent. Comm., App. II., p. 27 (♂, ♀; Portland in Oregon, Sisson in California).

Established synonyms are:—*T. caeruleipes* Scudder, *T. tessellata* McNeill and *T. caliginosa* McNeill.

Localities. Victoria, Ladysmith, Departure Bay, Qualicum, Dunsmuir, Alberni and Sproat Lake.

On the mainland of British Columbia this species (previously recorded as *T. caeruleipes*) is found locally at a number of points in the interior of the province from the Chilcotin area to the International Boundary and eastward to Creston on the Arrow Lakes. It does not occur in Canada east of British Columbia as far as present records go.

In the United States it is found in Montana, Idaho, Washington, Oregon, California, Utah and Arizona.

This is a very pretty blue-legged grasshopper which is found on Vancouver Island mainly on rocky out-croppings. It spends most of its time sunning itself on the exposed lichen-covered rocks where it is quite invisible when at rest. The strikingly beautiful, mottled, black and grey tegmina and pronotum of the Vancouver Island rock-inhabiting specimens are in striking contrast to many of the mainland individuals which frequent dusty hillsides and cultivated land. When at rest upon the rocks this species gives a splendid example of protective colouration.

This species flies rapidly with a zigzag flight and the males can emit a soft clicking sound when in flight. It is particularly common on the rocky land amongst the oak and broom on Mount Tolmie near Victoria and along the shoreline at Oak Bay and also at Departure Bay near Nanaimo.

Trimerotropis suffusus Scudder. The Snapping Locust.

1876—*Trimerotropis suffusus* Scudder. Bull. U.S. Geol. Surv. Terr., II. p. 265 (Vancouver Island in British Columbia).

¹⁹Hebard. Orthoptera of Montana. Proc. Acad. Nat. Sci. Phila., LXXX., p. 253, 1928.

1928—*Trimerotropis suffusus* Scudder. Hebard, Proc. Acad. Nat. Sci. Phila., LXXX, p. 261.

This is the species which has for a long time been recorded as *Circotettix suffusus* (Scudder). It is now thought best to return it to the genus *Trimerotropis*.

A study of this and allied species is, I believe, being prepared by Rehn and until his findings are published little can be said regarding its affinities.

Localities. Victoria, Sidney, Ladysmith, Departure Bay, Courtenay, Campbell River and Forbes' Landing.

This species probably occurs all over the southern and eastern portion of Vancouver Island wherever open woodlands and logged-off areas are to be found.

No one can mistake the snapping locust and all who walk through woodland paths and old logging trails must be familiar with him. Every little while he rises suddenly at your feet and dashes off into the air with loud snapping sounds made by his black and yellow wings, and circles hither and thither, to alight again behind you or a short way ahead on the trail. In late summer he is one of the most noticeable objects during a woodland walk.

This species is particularly common on the old logged-off lands around Courtenay.

Vancouver Island has been designated as the type locality of *suffusus* and as you get into Alberta and south into California and Utah it is probable that other races or species will be found to replace this species.²⁰

On the mainland of British Columbia, in the eastern foothills of the Rocky Mountains, in Alberta and in Montana, the material studied is probably best considered as slightly atypical *suffusus*, though south and west valid geographic races probably exist.

The distribution of *Trimerotropis suffusus* in British Columbia is very general and it has been taken in every locality where collecting has been done from southern British Columbia to the Canadian National Railway line which traverses the Nechako and Bulkeley Valleys from Prince George to Prince Rupert.

In Canada it is found only in British Columbia and western Alberta. To the eastward it is replaced by *Circotettix verruculatus* (Kirby) which it closely resembles; particularly so, in its nature of flight and other habits.

²⁰Hebard. Orthoptera of Montana. Proc. Acad. Nat. Sci. Phila., LXXX., p. 261, 1928.

In the United States typical and slightly atypical material appears to be confined to the States of Washington, Oregon, Idaho and Montana.²¹

Subfamily CYRTACANTHACRINAE.

Spine-breasted or Spur-throated Locusts.

This subfamily is very poorly represented on Vancouver Island and only three species are definitely known from this locality at the present time; all belong to the genus *Melanoplus*. On the mainland of British Columbia we find some thirty species and races and about fifty are known from Canada. To this subfamily belong many of the most destructive locusts of the world.

The members of this subfamily occurring in Canada are mainly of dull hue and without coloured wings. They are silent at all times, and most of them prefer to perch on plants rather than upon the bare soil. In the last subfamily, the Oedipodinae, the reverse was the case.

KEY TO THE SPECIES OF CYRTACANTHACRINAE OF VANCOUVER ISLAND

(Adult males only)

- A. Large species; with two bright yellow stripes commencing in front of eyes and running back over head and pronotum and continuing along dorsal field of closed tegmina. Cerci large, prominent, roughly sock-shaped. Furcula reduced to short flattened tubercles from tumid bases.
Two-striped Locust. *Melanoplus bivittatus* (Say).
- AA. Small species; without two yellow stripes on head, pronotum and tegmina. Cerci and furcula not as above.
 - B. Last ventral abdominal segment enlarged, broad, with rim of even height and not upturned nor notched in the centre.
Red-legged Locust. *Melanoplus femur-rubrum femur-rubrum* (De Geer)
 - C. Last ventral abdominal segment not enlarged, narrow, with rim distinctly upturned and notched in the centre.
Lesser Migratory Locust, *Melanoplus mexicanus bilituratus* (Walker).

Melanoplus bivittatus (Say) Two striped Locust.

1825—*Gryllus bivittatus* Say, Jour. Acad. Nat. Sci. Phila., IV., p. 308. (Arkansas River, near the Rocky Mountains, Colorado).

²¹In the Report of the Dominion Entomologist (Fletcher) for 1888, the Rev. W. G. Taylor records *Circotettix undulatus* (Thomas) from Vancouver Island. He states that this species is found until late in October and brackets it with *Arphia pseudonietana* (Thomas) and *Melanoplus bilituratus* Walker as the commonest species around Victoria. As he does not record *suffusus* at all, although it is extremely common around Victoria and as there are no other records of *Circotettix undulatus* from Vancouver Island or from the mainland west of the Coast and Cascade Mountains, I think it probable that this species was confused with *Trimerotropis suffusus* Scudder. The determinations were made for the Rev. W. G. Taylor by Laurence Brunner. Scudder records *Circotettix carlinianus* (Thomas) now known as *Aeroboreutes carlinianus* (Thomas) from Vancouver Island. Psyche, Vol. 9, p. 138, Dec., 1900. I think it is very doubtful if this record is correct as I do not believe this species could find a suitable habitat on Vancouver Island.

1838—*Caloptenus femoratus* Burmeister, Handb. Ent. II., Abth. II., Pt. I., (♂; Carolina).

1920—*Melanoplus bivittatus* (Say). Blatchley. Orth. of North-eastern America, p. 449.

“Though material with red caudal femora has persistently been recognized as *M. femoratus*, we believe that Kirby, E. M. Walker, Somes and Blatchley are correct in placing that name as a synonym of *bivittatus*. In the east, and also in the Sierra Nevada Mountains of the far west, individuals apparently invariably have rich red caudal tibiae, but this indicates rather a response to humidity and possibly other environmental factors than any specific or racial differentiation. Other established synonyms are *milberti* (Serville) *flavovittatus* (Harris) *edax* (Saussure) and *rejecta* (F. Walker).²²

Localities. Victoria, Cameron Lake, Forbes' Landing, and Newcastle.

The Two-striped Locust does not appear to be at all common on Vancouver Island. The author found a few specimens in the wet grass and sedges at Cameron Lake and close to Forbes' Landing on the banks of Campbell River. It is a common species in almost all parts of North America and will probably be found to occur at many other points on the Island where damp grass and patches of rank weeds are available.

This species is universally distributed in British Columbia at least as far north as Quesnel and it has also been taken in the B.C. Peace River district.

In Canada it is recorded from British Columbia to Nova Scotia and occurs also in Newfoundland.

According to Hebard this insect occurs everywhere in the United States except the southeastern portion and is extremely local in all the semi-arid regions of the west, there often confined to irrigated areas.

The specimens secured at Forbes' Landing and Cameron Lake were very brightly coloured and all had deep crimson hind tibiae. It is seldom in the province of British Columbia that really blue-legged specimens are found, although a good many have yellowish tibiae marked with blueish-black areas.

This species sometimes becomes sufficiently numerous in some parts of British Columbia and the Pacific Northwest to cause injury to alfalfa in irrigated districts.

Unlike the members of the last subfamily the members of the genus *Melanoplus* perch readily upon plants and often climb to considerable heights on fences and telephone poles, where they spend the night. The author has seen telephone poles thickly dotted with roosting *bivittatus* adults around the margins of alfalfa fields in the interior of the province.

This species is never likely to become of economic importance on Vancouver Island.

²²Hebard. Orthoptera of South Dakota. Proc. Acad. Nat. Sci. Phila., LXVII., p. 102, 1925.

Melanoplus femur-rubrum femur-rubrum (De Geer). Red-legged Locust.

1773—*Acrydium femur-rubrum* De Geer, Mem. l'Hist. Nat. Ins., III., p. 498, pl. 42, fig. 5. (♂; Pennsylvania).

1920—*Melanoplus femur-rubrum* (De Geer). Blatchley, Orth. of North-eastern America, p. 420.

"Scudder established the synonyms *erythropus* (Gmelin) *femorale* (Olivier) *devorator* (Scudder) *sanguinolentus* (Provancher) and *interior* Scudder; Caudell his own *coloradus*, and Rehn and Hebard Dodge's *plumbeus* . . . In the southeastern United States the typical race is supplanted by *M. femur-rubrum propinquus* Scudder."²³

Localities. Ladysmith and Fanny Bay.

The material collected by the author in the above localities were of unusually large size and deep, rich colouration. This species, like *bivittatus*, likes a considerable amount of humidity. They were found plentifully at Ladysmith and Fanny Bay in saline marshes where small streams formed extensive mud flats where they emptied into the sea. Here in the thick mat of grasses and other plants found in salt marshes this species, in company with the musical little Slender Meadow-grass-hopper *Conocephalus fasciatus vicinus* (Morse) were abundant, and formed a little ecological association of their own.

On the mainland of British Columbia this species is found throughout the province north to the Chilcotin district, in moist hay fields and marshes. It has never been known in any large numbers except in the Lower Fraser Valley around Huntingdon where, occasionally, it does some damage to the hay fields.

In Canada this is a common species from the Atlantic to the Pacific and has several times been recorded as doing considerable damage in Quebec and Ontario.

In the United States this race is found throughout the land except in the southeast, where the race *M. femur-rubrum popinquus* occurs. In the arid sections of the west it is confined to watered areas.²⁴

Melanoplus mexicanus bilituratus (F. Walker).

1870—*Caloptenus bilituratus* F. Walker. Cat. Derm. Salt. Brit. Mus., IV., p. 679, no. 10 (Vancouver Island, B.C.)

1897—*Melanoplus bilituratus* (F. Walker) Scudder. Proc. U.S. Nat. Mus., XX., p. 174.

²³Hebard. Orthoptera of South Dakota. Proc. Acad. Nat. Sci. Phila., LXXVII., p. 106, 1925.

²⁴*Melanoplus repletus* F. Walker was recorded from Vancouver Island by Francis Walker and described by him in the Cat. Derm. Salt. Brit. Mus., IV., p. 678. (1870). Mr. P. B. Uvarov, who has studied the Walkerian types in the British Museum of Natural History, informs me that the type of *repletus* has apparently been lost, but that he believes a female of *M. femur-rubrum* (De Geer) from "N. America" is the actual type of *repletus*, although he cannot as yet find any actual proof of it.

1922—*Melanoplus mexicanus bilituratus* (Walker). Buckell, Proc. B.C. Ent. Soc., p. 30.

Mr. B. P. Uvarov of the Imperial Bureau of Entomology, London, kindly examined the Walkerian types for me and informs me that *Melanoplus scriptus* (Walker) described from Vancouver Island by Francis Walker, is a synonym of *Melanoplus bilituratus* (Walker).

Hebard has since found that *bilituratus* is a geographic race of *Melanoplus mexicanus* (Saussure) and the type locality of this extreme north-western race is Vancouver Island.

Localities. Victoria, Duncan, Departure Bay, Qualicum, Fanny Bay, Campbell River, Cameron Lake, Alberni, Sproat Lake, Parksville and the Gulf Islands.

This is undoubtedly the commonest grasshopper to be found on Vancouver Island and the neighbouring Gulf Islands, and is responsible for more damage than all the other species combined. It is interesting to note that this species, together with *Trimerotropis fontana* and *T. suffusus*, was reported in 1929 by Mr. A. E. Pickford, Junior Forester at the Forest Experiment Station, Cowichan Lake, Vancouver Island, as doing damage to coniferous seedlings in the Forest Experiment Station. As far as I am aware this is the first record of serious damage by grasshoppers to conifers.

This grasshopper occurs on open, dry grasslands all over the cultivated portions of the Island and is particularly common on the dry grasslands in such localities as Beacon Hill Park and Oak Bay.

It was found commonly in suitable localities all the way up the east coast of the Island to Campbell River, and doubtless occurs further north wherever any clearings occur. The dry grasslands of some of the Gulf Islands, such as Denman Island, are particularly adapted to this species and reports of damage from the Islands are not uncommon.

On the mainland of British Columbia, west of the Coast and Cascade Mountains, this race may still be found; but as soon as the dry interior of the province is reached it becomes very atypical and is replaced by *Melanoplus mexicanus mexicanus* (Saussure) formerly known as *M. atlantis* (Riley) the Lesser Migratory Locust. This latter race occurs all over the remainder of North America except the tropical lowlands of Mexico, peninsular Florida and California west of the Sierra Nevada Mountains.²⁵ The Lesser Migratory Locust is the most injurious grasshopper occurring in the United States and Canada and in years of outbreak causes terrific loss of crops.²⁶

Family TETTIGONIIDAE. Long-horned Grasshoppers, Cave-cricket.

This family contains some of the less conspicuous members of Vancouver Island orthoptera. The members of this family are largely noc-

²⁵Hebard. Orthoptera of Montana. Proc. Acad. Nat. Sci. Phila., LXXX, p. 297, 1928.

²⁶The record of *Melanoplus devastator* Scudder for Vancouver Island (Caudell, 1908) has since been found to be incorrect. The single specimen proving to be a female of *M. femur-rubrum femur-rubrum* (De Geer).

turnal, and in some instances subterranean in habits, and are seldom seen unless special search is made for them. In this family the tarsi are four-jointed and the ovipositor compressed and blade-like, never needle-like as in the next family. The antennae are longer than the body, bristle shaped and delicately tapering. There are four subfamilies of *Tettigoniidae* containing in all six species recorded from Vancouver Island.

For the sake of abbreviation, and as three of the subfamilies of Vancouver Island orthoptera contain but one species, the following key is compiled for the determination, in one key, of the subfamilies and species occurring on the Island.

KEY TO THE SUBFAMILIES AND SPECIES OF VANCOUVER ISLAND TETTIGONIIDAE.

A. Tegmina and wings, or their rudiments, present.

B. Small slender species; general colour green, tegmina and wings passing the end of the hind thighs; head cone-shaped. Diurnal species, frequenting saline marshes and moist meadows.

Slender Meadow-grasshopper, *Conocephalus fasciatus vicinus* (Morse).

Subfamily CONOCEPHALINAE.

BB. Large stout species; general colour brown, tegmina rudimentary; wings abortive. Pronotum very large, saddle-shaped, extending well back over first few abdominal segments. Nocturnal species, frequenting dry open woodlands.

Saddle-backed Grasshopper, *Neduba carinata* Walker.

Subfamily DECTICINAE.

AA. Entirely apterous, without even rudiments of tegmina and wings.

B. Very large heavily built species; the pairs of legs of approximately equal length, short and stout; distal end of tibiae inflated and armed with heavy spines. Femora of fore and hind legs very broad and powerful. Head very large. Ovipositor very short. Subterranean species, burrowing in soil.

Stenoplematus longispina Brunner.

Subfamily STENOPELMATINAE.

BB. Medium size, more slenderly built species; hind pair of legs greatly exceeding the others in length and adapted for jumping. Head small and partly covered by pronotum. Ovipositor long, sword-shaped, and nearly straight. Antennae exceedingly long.

Subfamily RHAPHIDOPHORINAE.

C. Legs exceedingly long and spidery, all tibiae square in cross section with sharp, evenly serrated legs. Hind tibiae very much longer than total length of body.

Tropidischia xanthostoma (Scudder).

CC. Legs not unusually long and spidery; tibiae not square in cross section with evenly serrated edges. Hind tibiae little, if any, longer than total length of body.

Cave or Camel Crickets.

- D. Vertex between the antennae armed with a declivitous horn-like protuberance; abdomen of the male with four or five elevated smooth areas, none of which are more than one-half as high as broad.

Pristocephophilus celatus (Scudder).

- DD. Vertex between the antennae slightly tuberculate but never with a declivitous horn-like projection as above; abdomen of male smooth above.

Ceuthophilus agassizii (Scudder).

Subfamily CONOCEPHALINAE. The Cone-headed Grasshoppers.

This subfamily is well represented by several genera and many species in eastern North America both in Canada and the United States. As one comes west the number of species rapidly decreases and in British Columbia only one species has been recorded.

Conocephalus fasciatus vicinus (Morse). Slender Meadow-Grasshopper.

1881—*Xiphidium ensiferum* Scudder (not of 1862) Second Rept. U.S. Ent. Comm., 1880, App. ii, p. 23 (Glenbrook and Reno, Nevada).

1915—*Conocephalus fasciatus vicinus* (Morse). Rehn and Hebard, Trans. Amer. Ent. Soc., XLI., p. 177.

Synonyms of this species are *Xiphidium brevipenne* Scudder (not of 1862), Second Rept. U.S. Ent. Comm., 1880 (Sisson and Strawberry Valley, California, and *X. fasciatum* Scudder, in the above report from Portland, Oregon; *X. vicinum* Morse, Can. Ent. XXXIII., p. 203, from various localities in California, Oregon and Washington, and *X. vicinum* variety *productum* Morse, Can. Ent., XXXIII., p. 204 (Macopterous material in above series).²⁷

Localities. Ladysmith, Fanny Bay and Forbes' Landing.

This delicate green meadow-grasshopper was found in large numbers in company with *Melanoplus femur-rubrum femur rubrum* (De Geer) in the saline marshes along the coast of Ladysmith and Fanny Bay and doubtless occurs at other points on the coast where swamps and saline flats occur. A single specimen was also taken among rank, damp grass on the banks of Campbell River at Forbes' Landing in company with *Melanoplus bivittatus* (Say).

Hebard, to whom I sent material, informs me that these Vancouver Island specimens are all typical *fasciatus vicinus*, without a trace of a tendency towards typical *fasciatus fasciatus* which is the geographic race found to the east of the region of Pacific drainage in the United States and Canada.

When entering a marsh frequented by these meadow-grasshoppers on a hot day the air seems literally to quaver with a soft low hissing sound, produced by the males as they climb slowly about amongst the low plants. Allard has described this "song" as invariably beginning with

²⁷Rehn and Hebard. Trans. Amer. Ent. Soc., XLI., p. 177, 1915.

a succession of very faint notes, tse-tse-tse, repeated very slowly and terminating with the phrase tse-e-e-e-e-e-e-e-e which continues from five to twenty seconds.

In British Columbia this race has been taken at several points to the south of the main line of the Canadian Pacific Railway. In the eastern part of its range it shows tendencies towards the eastern race *fasciatus fasciatus*, which occurs from Alberta to Nova Scotia.

In the United States *vicinus* is found in Washington, Idaho, Utah, Nevada and California.

Subfamily DECTICINAE. The Shield-backed Grasshoppers.

This subfamily is only represented by one species on Vancouver Island. In British Columbia and the Pacific Northwest there are several species of this subfamily, such as the Mormon and Coulee crickets, which are at times exceedingly numerous and destructive.

Neduba carinata Walker. The Camouflage Cricket.

1869—*Neduba carinata* Walker. Cat. Derm. Salt. Brit. Mus., II., p. 251.

1907—*Neduba carinata* Walker. Caudell, Proc. U.S. Nat. Mus., XXXII., p. 296.

1929—*Neduba carinata* Walker. Fulton, Pan-Pacific Ent., V., p. 175.

Established synonyms are *Anytropteris steindachneri* Hermann and *Tropizaspis steindachneri* Scudder.

Localities. Thetis Island, Wellington, Parksville and Departure Bay.

The distribution of this insect seems to be confined to approximately the limit of oak and arbutus association on the south and east coast of Vancouver Island, as far north as Parksville. It was apparently absent further north, where the damper coniferous woods predominated.

On the mainland of British Columbia it does not extend east of the Coast and Cascade Mountains; the most easterly point where it has been collected is at Boston Bar in the Fraser River Canyon. A former record by the author from the Okanagan Valley proving incorrect.²⁸

In the United States the species occurs on the Pacific Coast from Washington to California, and it appears to be particularly common in Oregon.

Fulton²⁹ give this insect the name of "camouflage cricket" which is an excellent name for it. I do not know of any species where the art of camouflage is more perfect. While some specimens are almost unicolourous, others have their outline broken up by a patchwork of colours, rendering them practically invisible amongst the dry oak leaves and dead bracken fern which are generally present in the localities they inhabit. A description of the colour variations, distribution, habits and life-history of the camouflage cricket are given by Fulton in the paper referred to above.

²⁸Buckell. Proc. Ent. Soc. of B.C., No. 20, Syst. Series, 1922.

²⁹Fulton. Pan-Pac. Ent., Vol. V., No. 4, p. 175. Apl., 1929.

During the few days that the author spent in the neighbourhood of Departure Bay, every effort was made to collect a good series of this interesting cricket. I was never able to locate it during the day as I only heard it singing after dusk. By stalking a singing male with a flashlight I was able to secure about a dozen males, but failed to locate any females.

Even after a successful stalk and the light is directed at the sound, the insect is extremely hard to see, as it walks slowly or rests head-up on some dead twig or bracken stalk; should it jump to the ground among the dead leaves it becomes at once exceedingly hard to detect.

When collecting these insects in late August I found that the first song began about 8.00 p.m. and continued until about 2.00 a.m. when coolness caused them to cease. If the night were cold none would be heard singing. The "song" consisted of two sharp metallic ticks followed by three or four rather drawn-out sleepy-sounding notes:—tick-tick-zeeer-zeeer-zeeer. The entire call occupied two seconds and was repeated at regular intervals for from six to twenty-five times, after which the singer would remain quiet for a time. The song is rather feeble and does not carry far.

If the bush was not shaken a light could be brought to within one foot of the singing cricket without its taking alarm.

Subfamily STENOPELMATINAE.

This subfamily contains in North America an assemblage of rather curious species whose positive determination is greatly enhanced by their lack of uniform characters. Members of the same species often vary greatly in size of head, some showing a megacephalic condition, and in many of the species genital characters are so variable as to be of little assistance in separating the species.

One species has been recorded from Vancouver Island.

Stenopelmatus longispina Brunner.

1888—*Stenopelmatus longispina* Brunner, Vehr. zoöl-bot, Gesellsch. Wein, XXVIII., p. 260 (♂; Vancouver, British Columbia).

1916—*Stenopelmatus longispina* Brunner. Hebard, Jour. N.Y. Ent. Soc., Vol. XXIV., p. 80.

Established synonyms are *irregularis* Brunner, *californicus* Brunner and *terrenus* Rehn.

Localities. Victoria.

This species is recorded from Vancouver Island from one specimen collected at Victoria in 1905 by W. A. Hanham. As these large clumsy crickets spend their lives burrowing in the soil they are rarely found except by collectors who occasionally come upon them beneath old logs and rocks. Little is known of their life-history and habits.

On the mainland of British Columbia this species has been recorded from the vicinity of Vancouver. In the southern part of the Okanagan

Valley another species, *S. fuscus* Haldemann, has been taken by the author beneath boards and rocks around Oliver and Osoyoos.

Other records of *S. longispina* are from the Pacific Coast from British Columbia to Mexico.³⁰

These crickets, sometimes called Jerusalem crickets, or Sand crickets, are heavy, clumsy looking insects, with big heads and powerful jaws, and short, thick-set stumpy legs. They are one of the largest of our Canadian orthoptera.

Subfamily RHAPHIDOPHORINAE.

This subfamily is represented on Vancouver Island, as far as present records go, by three species. These insects are all nocturnal in habits, hiding away during the day under boards or stones. They frequently take up their abode in old wells, root cellars and caves and are often called Cave Crickets or Camel Crickets. It is very possible that other species will be found to inhabit Vancouver Island as they easily escape notice unless special watch is kept for them.

Tropidischia xanthostoma (Scudder).

1861—*Rhaphidophora xanthostoma* Scudder, Proc. Boston Soc. Nat. Hist. VIII., p. 12.

1916—*Tropidischia xanthostoma* (Scudder). Caudell, Proc. U.S. Nat. Mus. Vol. 49, p. 657.

Localities. Victoria and Nanaimo.

This long-legged nocturnal insect is not often found, in fact until a few years ago only a few specimens had ever been seen, and it was considered to be very rare. During recent years numbers of specimens have been secured on the Pacific Coast, especially by Fulton in Oregon, and his article on this strange insect is of very great interest.³¹

On Vancouver Island this species has been taken in Victoria and in an old ice-house at Nanaimo.

In Canada it occurs only on the Pacific Coast where it has, of recent years, been found fairly often in the City of Vancouver, particularly in the vicinity of Stanley Park, where heavy native timber is still preserved.

In the United States it has been taken in Washington, Oregon, and California.

The following account of the habits of this species is taken from the account by Fulton mentioned above.—The accidental discovery of a colony of these strange crickets, standing together upside down under the logs of an old bridge in a valley in the Coast Mountains of Oregon, made it possible to observe some of their habits. When a flashlight was turned on to the colony they began to move into the dark recesses. They could run rapidly on their fantastically long legs, and those that

³⁰Hebard, Jour. N.Y. Ent. Soc., XXIV., p. 80, 1916.

³¹Fulton, Ent. News., XXXIX., p. 8, Jan., 1928.

started for the far corners soon escaped. Later on the examination of bridges in the timbered areas disclosed other colonies of these shadowy crickets, always standing about in groups, apparently with nothing to do. The examination of a colony living under a bridge or a stream at night disclosed them wandering about at the water's edge, and one was found apparently feeding upon a small mushroom.

The living insects have a dark, rich, chocolate-coloured body with a velvety appearance. The head and legs are lighter. The most unique feature about the insect is the shape of the tibiae, which are perfectly square in cross section and each of the four corners is finely serrated with short spines. The antennae of an adult male measured 120mm. in length. The hind femora of the same were 30mm. long and the tibiae 37mm.

It would be possible for this insect to extend itself to a length of eight inches from tips of antennae to the hind tarsal claws, while the body itself even in the living insect would measure only about 20mm.

Pristoceuthophilus celatus (Scudder).

1894—*Ceuthophilus celatus* Scudder. Proc. Amer. Acad. Sci. Arts, Vol. 30, p. 48.

1916—*Pristoceuthophilus celatus* (Scudder). Caudell, Proc. U.S. Nat. Mus., Vol. 49, p. 671.

Synonyms of this species are *Ceuthophilus henshawi* Scudder and *Marsa henshawi* Scudder.

Localities. Sidney, Duncan and Departure Bay.

This cave cricket has been collected on several occasions on Vancouver Island in the above named localities. It is probably more numerous than it appears, as it is nocturnal. It is a species that seems to be very restricted in its habits and the author is aware of two similar root-houses close together; one of which always contains a colony of these cave crickets, while the other appears to be entirely free of them.

On the mainland of British Columbia it has been recorded from various points in the south part of the province to Kalso on the Kootenay Lake. It has not been recorded in Canada east of Alberta.

In the United States it has been recorded only from California and Oregon, but doubtless occurs also in the Pacific Coast region of Washington.

There are several other species of this genus which should be found on Vancouver Island if careful collecting is done. *P. pacificus* (Thomas) and *P. gaigei* Hubbell occur on the mainland of British Columbia in addition to *P. celatus* (Scudder).

It is interesting to record that, as far as I am aware, the only species of othoptera as yet recorded from Queen Charlotte Islands is *P. celatus* from Skidegate, Graham Island.

Ceuthophilus agassizii (Scudder).

1861—*Rhaphidophora agassizii* Scudder Proc. Boston Soc. Nat. Hist., VIII., p. 11.

1894—*Ceuthophilus agassizii* (Scudder) Proc. Amer. Acad. Arts. Sci., XXX., p. 81.

Ceuthophilus zonarius Walker is a synonym of this species.

Localities. Victoria.

This large pale brown cave cricket is common in the vicinity of Victoria, from which point it has been recorded on a number of occasions. It is probable that it will be found to occur all over the southern half of the island. It is nocturnal, but is often found during the day time hiding under stones and pieces of board in gardens, or in garages and cellars.

It has been found on the mainland of British Columbia at widely scattered points north to the Chilcotin District. It has been recorded also from Alberta and Manitoba.

In the United States Scudder records it from Oregon and from the Islands in the Gulf of Georgia between Vancouver Island and the State of Washington.³²

Family GRYLLIDAE. The True Crickets.

This family is represented on Vancouver Island by two species, each belonging to a separate subfamily. This family contains the true crickets such as the field-crickets, tree-crickets, mole-crickets and the minute ant-crickets.

KEY TO THE SPECIES OF VANCOUVER ISLAND GRYLLIDAE.

- A. Large black species; tegmina present, body elongate; hind femora elongate, not exceptionally swollen. Lives under stones and in holes in ground in thick grass; male chirps throughout the heat of the day.
Field Cricket, *Gryllus assimilis* (Fabricius).
Subfamily GRYLLINAE.
- AA. Minute brown species; wingless, body subspherical, hind femora ovate, compressed, very greatly enlarged. Lives in ants' nests.
Ant-cricket, *Myrmecophila oregonensis* Bruner.
Subfamily MYRMECOPHILINAE.

³²*Ceuthophilus californicus* Scudder was recorded from Vancouver Island as *C. castaneus* Thomas in the Rept. Dom. Ent. (Fletcher), for 1888, collected by the Rev. W. G. Taylor. He records it as "not uncommon" at Victoria but does not list *agassizii* as occurring at all, although it is a common species at Victoria. That his material was *agassizii* is further borne out by Scudder, who records *agassizii* from Bruner's collection, collected by the Rev. W. G. Taylor (Proc. Amer. Acad. Arts. Sci., XXX., p. 82, 1894).

Subfamily GRYLLINAE. *Field Crickets*

Only one species is known from Vancouver Island.

Gryllus assimilis (Fabricius). Common Field-cricket.

1775—*Acheta assimilis* Fabricius. Syst. Ent., p. 280. Jamaica.

1915—*Gryllus assimilis* (Fabricius). Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., p. 295.

It is now generally accepted that although some forty-five synonyms of this species are known that they represent but "variants" of one very variable species.

Localities. Victoria, Ladysmith, Nanaimo, Departure Bay, Duncan, Qualicum, Dunsmuir, Fanny Bay, Campbell River, Sproat Lake, Parksville, and Cameron Lake.

This black cricket is exceedingly common all along the south and east coast of the Island from Victoria to Campbell River. It is still found in smaller numbers around Cameron Lake and a few at Sproat Lake but appears to be absent at Alberni.

Its habitat is mainly the dry grasslands adjoining the shore, where it lives under stones, pieces of boards and in the mouse runs and mouse holes among the short grass. This location seems ideal for them and they are present in incredible numbers; the shrill chirping of the males throughout the heat of the day and often far into the night must be familiar to all who live upon, or have visited the Island. Their merry chirping may be heard everywhere, both in the country and in the cities, where they inhabit every vacant lot and garden. Pieces of board left lying out on dry grasslands will attract them in hundreds and on being turned over will disclose a solid sheet of crickets beneath it. Immediately upon being exposed to the light these shiny black crickets of both sexes and all ages will scramble hurriedly away and disappear in the dry surrounding grass.

On the mainland of British Columbia this cricket, while it has been recorded at a number of points throughout the province south of the Chilcotin District, is rare compared to Vancouver Island. It occurs mainly in very hot dry situations along railway tracks and in rock piles and at the base of cliffs. They hibernate in the nymph stage.

This is a very widely distributed species, extending from southern Canada to Patagonia.

Subfamily MYRMECOPHILINAE. The Ant-crickets.

This subfamily contains the genus *Myrmecophila* which is composed of a number of minute crickets which live in ants' nests. One of these little crickets is quite common in ants' nests in the vicinity of Victoria on Vancouver Island.

Myrmecophila oregonensis Bruner.

1884—*Myrmecophila oregonensis* Bruner. Can. Ent., XVI., p. 43 (♂ juv.; Portland, Oregon).

1920—*Myrmecophila oregonensis* Bruner. Hebard, Trans. Amer. Ent. Soc., XLVI., p. 100.

Myrmecophila formicarium Scudder is a synonym of this species.

Localities. Victoria, Wellington, Nanaimo, Departure Bay, and Fanny Bay.

This minute cricket occurs in ants' nests of several kinds on Vancouver Island. It is particularly partial to the large mound-building ant *Formica rufa* Linnaeus, subspecies *obscuripes* Forel. The nests of these ants are particularly common in open coniferous forests at Langford and Metchosin near Victoria.

Beall³³ gives an interesting account of these little crickets. He found that the ants had regular routes leading from their nests and that the little crickets would frequent these routes. Where an ant route ran along the top of a piece of wood the crickets would congregate beneath and he estimated that as many as five hundred crickets could be found congregated around a main ant runway.

On the mainland of British Columbia this ant-cricket occurs at the Coast, but does not apparently occur east of the Coast and Cascade Mountains in Canada. The author has collected ants for many years in the interior of the province and kept a close watch for these crickets but has never yet found one to the east of the Coast Range.

In the United States it is found in ants' nests in Washington, Oregon and California.

³³Beall. Proc. B.C. Ent. Soc., for 1929, p. 44.

