instar, but with markings more decided. There is a certain amount of variation in the size and intensity of the black markings on the dorsal surface and especially the lateral hyphens which are sometimes fused to form solid black lines but slightly interrupted between segments. Head pale sea-green, with small black dots arranged in four vertical rows, two on each side. The larva ceased feeding on June 19, three days before the pupal stage was assumed and spins a very thin webbing either between two leaves, among the moss on the trunk, or on the ground at the base of the tree. Length of larva just before pupation, 40 mm. Stadium, 22 days.

Pupa. Pupation June 22. Length of pupa 28 mm., width 4 mm.; wing cases fuscous; abdominal segments beige with small black dots; anal segment black; cremaster consisting of two stout terminal hooked setae and two to six smaller ones at the base. The pupa is held in place chiefly by the entanglement of the cremaster among the fibres of the web spun by the larva. Pupal period, 24 days.

Imago. First emergence on July 16. There was considerable variation in length of instars among individuals. Under natural conditions the larvae averaged 25 mm. on July 22 or about the same stage of development which had been reached on May 31 by those under control. The larvae remain very quiet except when feeding; they rest along the midrib on the underside of the leaves or on moss and bark often with the head shielded from daylight.

Summary. Ova laid under confined conditions on September 18, 1947, were kept in an equably cool room temperature throughout the winter. The larvae emerged May 1, 1948, and were fed on Garry Oak, *Quercus garryana*, completing their life cycle in 75 days from time of emergence from the egg. The first instar was completed in 8 days; second instar, 10 days; third instar, 13 days; fourth instar, 22 days and pupa, 24 days. Each instar was progressively longer than the preceding one. The last instar, however, included three or four days devoted to spinning and lying quiescent prior to pupation.

BIOLOGY OF ANISOLABIS MARITIMA (GENE) THE SEASIDE EARWIG, ON VANCOUVER ISLAND (Dermaptera, Labiduridae)

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Introduction — *Anisolabis maritima* (Gene), a large and fearsome appearing apterous earwig, inhabiting a restricted zone at the line of highest tides, is not likely to escape notice for very long where it occurs in settled districts. E. R. Buckell has given a resumé of its known range, and an account of its discovery on Vancouver Island by Professor G. V. Spencer in 1926[1], and it will not be necessary to go over this information here. The species in 20 years or more does not seem to have become very generally distributed on the British Columbia coast. It is now very abundant on the shore of Vancouver Island from Departure Bay where it was reported first to at least as far as the cove beyond Neck Point, a distance of only six or seven miles along the tortuous shore line.

After fairly careful search at several points along the coast, I found specimens in only one other locality, a few small islets known as Dayman Id. lying close to Kuper Id. I made unsuccessful searches at Separation Point, near Cowichan Bay; Dodd Narrows, south of Nanaimo; and French Creek, near Qualicum Beach. It is interesting to note that Professor Spencer found them on a small island, possibly Snake Id., three miles from Departure Bay. It appears that these earwigs are more apt to travel by water than along the shore. There is a record in the Report of the

Provincial Museum for 1947 of two examples of "seaside earwigs" found near Vancouver. I am indebted to G. H. Hardy for the information that these specimens were taken at Tsawavassen Beach by Mr. F. Goertz. Unfortunately they were not preserved, but the record must be accepted as fairly definite proof that *Anisolabis* is now also established on the British Columbia mainland.

Resume of Life History—A study of the life history of *Anisolabis* leaves little doubt that it is a species adapted for life in tropical regions. Due to its ability to endure long periods of suspended development it survives in temperate climates, where the winters are not too long or severe. In this respect it differs strongly from *Forficula*, which grows rapidly at rather low temperatures and so appears much better suited for northern conditions.

On Vancouver Island seaside earwigs mature in two years. Ova are deposited during spring or summer as soon as temperature is suitable. This is seldom earlier than July, although unusually warm weather in the spring may result in oviposition taking place before the end of May. Under normal summer temperature on Vancouver Island ova will hatch after 30 to 45 days. C. B. Bennett[2] reported that on the New York coast ova hatched in 17 days, but he did not mention what temperature was required to produce this result. The nymphs attain only the first or second instar by the time winter conditions force them into hibernation. The remaining three or four stadia are usually completed during the second summer, but many pass a second winter as fifth instar nymphs.

One of my captive seaside earwigs, kept under constant high temperatures, oviposited 43 days after reaching maturity. This evidence shows that individuals which winter during their fifth stadium would reproduce next summer, the dormant period being unnecessary. It also indicates that *Anisolabis* under tropical conditions may maintain a continuous and quite rapid cycle of growth and reproduction.

Brooding by Females—As is usual with Dermaptera, female *Anisolabis* watch over and care for their eggs and young nymphs. An elaborate cell is prepared by the insect when she is nearly ready to oviposit, several nights being devoted to the task. This chamber appears to the observer much larger than necessary, plenty of room is allowed for the insect to move around and to spread out her eggs. A favorite location for cells is under the bark of rotten logs, though they are often in sand under driftwood. The earwigs show a strongly developed instinct in selecting suitable sites which will remain constantly moist, and yet be above the reach of ordinary summer tides. The brooding females are very aggressive in protecting their ova, much more so than *Forficula*. They will not permit others of their own kind to enter the cell. The forceps are used as weapons, the insect striking over her back with such force as to throw herself completely on end. They have, however, a sense of proportion. The hand of an observer approaching the cell causes immediate retreat.

Two female seaside earwigs have hatched their ova under my observation. The first batch, deposited on July 13, hatched without artificial aid in 30 days. At this time I did not keep a record of temperatures but fairly constant warm weather prevailed. Another lot deposited August 18 were kept without artificial heat until September 18. Average temperature during this period, arrived at by taking readings twice daily, was 63°F. By this time well-developed embryos could be seen in the eggs. As progress seemed to be very slow the temperature was increased to 75°F. or higher, which resulted in the first nymph appearing on October 4, an incubation period of 47 days. Several more days were required to complete the hatching, and a total of 62 days elapsed before the parent insect was seen to leave the cell to search for food. The nymphs did not appear on the surface of the soil until they were four or five weeks old. They remained in seclusion in a system of burrows constructed by

their mother, and into which she dragged all the food provided for her use.

During 1947, when unusually warm weather occurred both in April and May, I found on June 30 females with ova nearly ready to hatch. None of the earwigs which I kept in captivity that year oviposited before mid-August. At that time a period of cool weather set in but artificial heat was not provided and after periods ranging from 45 to 60 days all the parent earwigs ate their own eggs, even though well-developed embryos could be seen in some cases. This must be a common occurrence under natural conditions on Vancouver Island.

I have found no evidence to indicate that female *Anisolabis* oviposit a second time, as is the case with *Forficula*. The former are long-lived insects, especially the females. Two which had oviposited in captivity were kept through the winter and up to July of the following year, when they died at an age of approximately three years.

Growth of Nymphs — As indicated above, *Anisolabis* pass through five nymphal instars, instead of only four as with *Forficula*. The length of each stadium varies greatly according to the temperature. My observations indicate that the rate of growth increases very rapidly as the temperature is raised. Below 60°F. little or no progress seems to be made. Unfortunately I was not able to keep heat steady enough to make any exact calculations. A nymph kept at temperatures ranging from 55°F. to 70°F. completed its second stadium in 90 days, its third in 37 days at slightly higher temperature and the fourth in 19 days with temperatures from 85°F. to 105°F.

My observations of the life cycle of seaside earwigs under natural conditions showed clearly that if a five-month hibernation period is disregarded, the average stadium is of two calendar months' duration. Thus an individual hatched, as is usual, early in August will reach the adult stage during October of the following year, after the lapse of fifteen months. Of this period five months, November to March inclusive, are too cool for any growth to take place. Except for size the external appearance of *Anisolabis* nymphs alters very little during their entire development. Tegmina and wings are absent even in the adult. The forceps are well formed in the first instar, differing in this respect from those of *Forficula*, which are straight and threadlike at birth.

Although the antennae of *Forficula* show an increase in the number of segments with each moult, those of a few exuviae of *Anisolabis* nymphs of unknown instars which I examined numbered 17 in nearly every case. Two specimens known to be of the first and last nymphal instars had 15 and 17 antennal segments respectively. Buckell stated that the antennae of adult *Anisolabis* carry from 20 to 24 segments, so some variation must be expected in the nymphs also. The adults can be easily distinguished from immature forms with the unaided eye. Adult females have only six abdominal sterna visible, instead of eight as with nymphs and adult males. The forceps of adult males are distinctive.

Behaviour of Adults—The dependence of seaside earwigs on damp conditions and their strict confinement to a narrow belt at high tide level, has been somewhat exaggerated by writers. I have found many of the insects under bark of logs and amongst trash even well above the line of winter tides. Here they were associated with many European earwigs. If able to find water when abroad at night *Anisolabis* are evidently able to stand dry conditions as well as *Forficula*, but they do not so persistently avoid damp situations as the latter species. The zone which *Anisolabis* normally inhabits is also the home of spiders, oniscoids, several species of beetles and other common terrestial arthropods. During mild weather, even in winter, seaside earwigs may be found below the tide level, but near freezing temperature will drive them into complete dormancy. At such times they invariably seek cover well above the line

of highest tides. I have found many individuals in all stages of growth, hibernating under logs and boards in company with European earwigs and various beetle larvae.

The chief occupation of adult *Anisolabis* seems to be the digging of burrows. Two inches of damp sand in a quart jar will be converted into such a maze of tunnels that it is difficult to understand what prevents the whole affair from collapsing. Digging is accomplished with the mandibles alone, grains of sand and small stones being dislodged and carried to the surface. Food is often taken into these tunnels, by non-brooding adults, as well as those with young. It thus appears that the feeding of young nymphs by their mother may be by chance rather than design. Nevertheless their is no doubt that the habit is of great use in providing a supply of food for the nymphs during the first part of their lives.

Food—*Anisolabis maritima* must be considered a carnivorous species. Any vegetable food they take is so little as to be negligible. In captivity they ate any sort of dead animal matter. I fed them chiefly on crushed tiny crabs and dead flies. I have never noticed them killing any active insects, though they ate ova and sluggish larvae. As a result of many tests, I have concluded that they never eat herbage or seaweed of any kind. They are fond of wheat softened by soaking, and hollow out the grains until a neat shell remains. On rare occasions I have seen them eat potato. Their natural food is doubtless gleaned from the shore where small crustaceans and drowned insects are thrown up by the waves. The eggs and larvae of Diptera which breed in decaying seaweed may provide them with a great part of their sustenance.

Methods of Rearing and Observation — Seaside earwigs will thrive in glass jars with nearly tight covers. They are unable to climb out of ordinary jars, but if these are left uncovered when rearing at high temperatures, constant attention must be paid to replenishing moisture. I provide the nymphs with very little cover, a quarter inch of sand is sufficient, but care must be taken to keep this moist as the insects will soon die if it becomes quite dry. Excessive litter makes it impossible to keep a close check on ecdyses.

For the purpose of recording moults, three methods may be considered. First, since earwigs are absolutely white immediately after ecdysis, and do not recover full pigmentation for some hours, checking twice daily is nearly certain to result in nymphs being noticed while still pale. Second, as earwigs do not as a rule eat the exuviae, these can be found without difficulty if litter is kept to a minimum. Third, the most positive method is to clip off part of one of the forceps. If this is done soon after a moult, the part will be found partly or wholly restored after the next transformation. It is necessary to quieten the insects in order to perform this operation, or when counting abdominal segments. This is most easily done by exposing them to low temperature. A temperature of 35°F. will in a few hours render them quite immobile. Failing this, they can be placed in a cyanide killing vial, and taken out immediately they become quiet.

When observing brooding females, an inch or more of packed sand or soil must be provided. If unable to construct a proper cell the earwigs will eat their eggs. With luck, the cell may be built against the side of the jar, which was the case with the insect whose family life is described in this paper. These insects seem to know by instinct when night has fallen, and pay little or no attention to artificial light. For this reason their habits are easily observed. With a hundred watt light bulb not over ten feet from the jars, I have frequently watched them feeding, and constructing cells or burrows. Even by daylight they are quickly able to detect the presence of food in their cages. A few moments after a dead fly is dropped in, the sensitive antennae will be seen at the burrow entrance, waving slowly as their owner decides whether the coast is clear. If all remains quiet the earwig comes into the

open and seizes the fly with its mandibles. I have never seen the forceps used for this purpose. The food may be carried at once into the burrow, or tucked under any convenient stone or chip.

1 Buckell E. R. 1930 Ent. Soc. B. C., 27: 22-23, also, Spencer G. J. 1926 Can. Ent. 58 (8): 183-184.
2 Bennett C. B. 1904 Psyche, II (3): 47-53.

NOTES ON VANCOUVER ISLAND AND WEST COAST COLEOPTERA

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The following notes concern certain coleoptera belonging to the families Carabidae, Lucanidae and Cerambycidae and include references to new locality records and to matters of biological or ecological significance.

CARABIDAE

Zacotus matthewsii LeC. As this handsome species is comparatively rare in collections, its occurrence is worth passing mention, particularly as in the present instance, when it was found in the crop of a screech owl taken on Goose Island, B. C., by G. J. Guiguet during the summer of 1948. Three specimens were extracted from the crop, all sufficiently well preserved to make identification certain. The crepuscular habit of this species is no doubt one reason why it is not more common in collections. Evidently the owl, whose appearance abroad coincides with that of the beetle, had no difficulty in finding it in numbers.

Z. matthewsii was originally described by LeConte in 1868 from specimens collected on Vancouver Island by Mr. Matthews, for whom the species was named. So far as I am aware the above is the first record for Goose Island and provides a considerable northern extension of the known range for the species. Goose Island lies off the mainland just south of parallel 52° and some 80 miles to the north of Cape Sutton, Vancouver Island.

LUCANIDAE

Ceruchus striatus LeC. Two specimens of this characteristic species were taken from the crop of the same screech owl. While common, the mode of capture is somewhat unique. This is also a first record for Goose Island.

CERAMBYCIDAE

Plectrura spinicauda Mann. A wing case and head of this unusual Cerambycid were found in the crop of another screech owl collected at the same time and place. This species is reported along the coast from Alaska to California, though not known formerly from Goose Island.

Eumichthus oedipus LeC. A single specimen of this scarce beetle collected at Buttle Lake, Vancouver Island, on July 22, 1948, by E. G. Harvey of the Victoria Forest Insect Laboratory establishes a new locality record.

Dicentrus bluthneri LeC. One individual of this apparently very local British Columbia species was obtained on Valdez Island by E. G. Harvey, May 14, 1948. This constitutes a new locality record and to my knowledge, only the third for British Columbia. All three places are quite close together, Duncan, Valdez Island, and Pender Island. In connection with the last-named place, I have a note made from a conversation with G. R. Hopping, to the effect that he took it in numbers at Pender Harbour in May, 1926, where it was running about and pairing on poles of recently cut hemlock *Tsuga heterophylla*.