

notum of *plenoculoides* as carinate, which certainly does not apply to the present species.

Described from a single female collected at Berkeley, California, May 12, 1912 (Bridwell). Type in author's collection.

**Notes on the Bruchidae (Coleoptera) and their Parasites in the Hawaiian Islands, 3rd Paper.**

BY JOHN COLBURN BRIDWELL.

**Bruchus prosopis** Leconte.

This species has been increasingly numerous and destructive in its attacks upon the seeds of *Prosopis juliflora*. This condition led to the problem being taken up by the Union Feed Co. of Honolulu, who made possible the continuance of investigation on the weevil injury to the algaroba beans. An economic report upon these injuries was submitted to Mr. F. W. Mcfarlane, the president of this company, on December 24, 1919, and this is soon to be printed in a slightly altered form in the Hawaiian Sugar Planters' Record. On Feb. 1, 1920, these investigation were taken up by the Bureau of Entomology of the U. S. Department of Agriculture, and these notes are designed to bring up my records regarding the Bruchids to that date.

The attack by this species upon the young pods begins soon after they are set, when the seed is very small and the whole pod is only about one-eighth of an inch in thickness. The eggs are laid singly or in small masses of two or three, or perhaps more, cemented lightly to the pod.

The puncture made by the hatching larva results in a copious exudation of gum which is at first clear but later becomes brownish. This seals the entrance hole and often dislodges the egg mass so that the other larvae are unable to enter the pod.

The eggs of this species being usually laid at a time

when the pod is very young and in a formative condition, the larva on entering sets up a considerable disturbance in the developing tissue, some of it probably caused by the entrance of bacteria. If the eggs are laid on the edge where the young saclike developing seed is attached, this injury very frequently prevents further growth of the embryo seed, and thus a considerable loss of beans is caused in which the young larvae have not fed. The pod is also frequently deformed as the result of these attacks.

The young larva, instead of entering the developing seed at once, feeds for some time in the gummy or syrupy layer between the inner and outer fibrous layers of the pod. It is not until the young seed has reached practically its full dimensions and when its cotyledons are firm in texture that the larva enters at one edge and makes its way to near the center of the seed. Here it feeds rapidly and attains full growth and pupates after destroying the entire embryo before the pod has reached its full thickness and before the pulpy and syrupy layer has attained its full thickness.

The young pod is at this time about three-sixteenths of an inch or less in thickness, against the five-sixteenths of an inch attained at full maturity, and the pod is much easier of penetration by the ovipositor of the parasites than later when the fibrous layers have become hard and woody. It is at this time the attacks of *Heterospilus prosopidis* Viereck upon the *Bruchus* larvae usually take place.

The destruction of the very young beans and the eating of the green beans in a later stage of their development constitute the greater part of the injury done by this *Bruchus*.

The adult weevils can, as has been previously recorded, oviposit in crevices in the ripe pod, very often in the holes from which the weevils have emerged, and the larvae enter into the ripe seed and devour its contents. It seems probable that this reinfestation is likely to be more extensive when the pods are so damp as to give considerable fluidity to the syrupy contents of the pulp and to soften the seed coats.

While the observations have not been carried out to enable us to state with exactness the time required for the development of *Bruchus prosopis* in the green pods, the indications are that the period is about four to six weeks from oviposition to the emergence of the adult upon the pod. In any case the emergence from the pod takes place soon after the ripe pod falls to the ground or even before, some even while the pod is still green. In any case all the injury from the initial attack is completed by the beginning of storage while much of the emergence is completed soon after.

In contrast to this short period for development, the only record of timed breeding from ripe pods yet secured gives a period of 130 days for development during the cooler months of the year here.

#### ***Bruchus sallaei* Sharp.**

This species has now spread from the originally discovered center of infestation upon Punchbowl crater to both extremities of the island of Oahu at Kaena and Makapuu Points.

Observations previously made indicated that this species could breed at the expense of the seeds of *Prosopis juliflora*. In November, 1919, examination of weevils bred by Mr. Pemberton from pods of algaroba gathered at Waikiki showed that 23% belonged to this species and more recent breedings show that this species frequently outnumbers *B. prosopis* in the pods of *Prosopis*.

It is exceedingly curious that the eggs of this species now seem to be much more frequently laid in compact masses of 2-7, or more eggs, than previously observed. In 1918, only an indication of this was observed but now the prevailing method of oviposition upon the pods is in masses. The eggs laid upon the seeds of *Acacia farnesiana* within the pods seem to be always laid scattered. Ordinarily the eggs of this species are not laid upon the green pods of *Acacia farnesiana*, but Mr. Swezey has shown me a few laid upon green but

mostly well-grown pods. On the other hand the eggs seem to be laid upon the pods of *Prosopis* in all stages of growth from the newly set pods to those fully ripe. It does not show the aversion to laying its egg masses upon exposed surfaces which is so characteristic of *B. prosopis* when laying upon the ripe pods.

The eggs from this species when laid in masses are not readily distinguishable from those of *B. prosopis*, though the latter seem to be somewhat smaller and more slender.

There is every indication that in this species, which until last year was not known to attack the seeds of *Prosopis*, we have an enemy of first importance more adaptable and perhaps more serious than either of the other species attacking this crop in the Hawaiian Islands.

***Bruchus limbatus* (Horn).**

In June, 1919, Mr. Swezey and Mr. Pemberton found at Waipio, Oahu, a seed of the monkey-pod (*Samanea saman*) bearing eggs of a Bruchid. After bringing this into the laboratory, four adults emerged from the seed. Examination of these led to their determination by the writer as *Bruchus limbatus* Horn, an inhabitant of the arid Southwest, Texas, Arizona, South California and Mexico.

Subsequently the species has been found rather generally distributed in Honolulu and as far along the Kamehameha highway as Castner. It has not yet been found upon the windward side of Oahu.

Besides *Samanea saman*, this species has been found here breeding naturally in the seeds of *Pithecolobium dulce* and *Albizia lebbek*, while it has been bred experimentally from the seeds of *Acacia farnesiana* and from the pods of *Prosopis juliflora*. In the latter case the breeding was secured only after repeated experiment and then only a few adults emerged. It is interesting to note that most of the trees upon which it has been found breeding in the open here are natives of its home country, or at least of the American continent. They

are all plants of considerable importance in tropical agriculture and forestry.

It is uncertain how long the species has been established in the islands but certainly its general spread over this island has occurred since 1917, since the trees of *Pithecolobium* under which extensive collections of seeds were made at that time without finding this weevil, have the fallen seeds infested now.

Cushman has recorded this species (Jour. Econ. Ent. 4:498, 1911) as bred from an unknown leguminous chaparral at Brownsville, Texas, called "tenaza" by the Mexicans, and from *Siderocarpus flexicaulis*. Amundsen reported this species from an undertermined Mexican legume presumably growing at San Diego, California, called Guamuchile by the Mexicans. This plant, judging from his figure of the pod and seed, is *Pithecolobium unguiscatae* or some allied species.

On Dec. 26, 1919, this weevil was found at work on the fallen pods of *Samanea saman* on the government road not far from Pearl City. Eggs had been laid in great numbers on the under side of the old pods as they lay on the ground and many others on the seeds as they had been exposed by the weathering of the pods. Those eggs so concealed had been but little parasitized by *Uscana*, though a few parasitized eggs were seen.

Examination of the pods showed them to be in general without syrupy contents. They were also somewhat attacked by *Pyroderces rileyi*, and one or two other moths, by *Araecerus fasciculatus* and one of the species of *Carpophilus*.

A well-grown pod at maturity is about 6-8 inches long, not quite an inch wide and a half inch thick and contains 18-22 or more seeds, each in a separate chamber formed by the firm, rather woody layer of the pod, with layers of the two valves touching each other between the seeds. There is a cellular syrupy layer between the inner layer and the firm cuticle. Each edge of the pod is thickened and the pods do not dehisce. The seeds are  $\frac{3}{8}$  in. (9 mm.) long, nearly

5/16 in. (7 mm.) wide and 9/32 (5.5 mm.) thick, shaped like a grain of corn as seen flat and thicker before the middle. There is no apparent albumen and the seed coat is thickest at the edge. The emergence holes of the weevils are therefore generally found along the edge of the seed.

From 69 seeds examined from a lot in which the weevils had been breeding for three generations 193 weevils had bred as follows:

From 13 seeds containing 1 exit hole .....	13
“ 20 “ “ 2 “ holes .....	40
“ 20 “ “ 3 “ “ .....	60
“ 8 “ “ 4 “ “ .....	32
“ 3 “ “ 5 “ “ .....	15
“ 3 “ “ 6 “ “ .....	18
“ 1 “ “ 7 “ “ .....	7

In the “Table of Hawaiian Bruchidae” (these Proceedings 3:466, 1918) this species would run to 8 and differs from *Bruchus pruvininus* by the red markings of the elytra.

**Caryoborus gonagra (Fabricius).**

While the eggs of *Bruchus prosopis* are laid early enough in the development of the algaroba pods that the principal damage is completed before the crop is harvested, this species oviposits usually upon the ripe pods and the main feeding is done in stored beans.

**USCANA SEMIFUMIPENNIS LAYING IN EGGS OF BRUCHUS SALLAEI.**

On November 25, newly emerged *Bruchus sallaei* females were placed with a pod of *Acacia farnesiana* and left until about 10 a. m., November 27, when many eggs had been laid scattered on one surface. This pod was then placed in a test tube with newly emerged *Uscana* from eggs of *Caryoborus*. By 12 m. the females were seen ovipositing and mating was in progress.

From the effects of the parasitization all but one of the eggs were later found to be parasitized.

Later observations indicate that the attacks of this species are confined to the recently laid (unincubated) eggs of its hosts.

The parasitization records of this species now include *Bruchus prosopis* and *Bruchus limbatus*.

I have observed eggs of *Bruchus sallaei* and *Bruchus prosopis* concealed within pods parasitized by this species.

## Descriptions of New Genera and Species of Hawaiian Encyrtidae (Hymenoptera), II.

BY P. H. TIMBERLAKE.

### ECTROMATINI.

*Anagyrus antoninae* n. sp. Figs. 1, 2.

A rather slender species belonging in the subgenus *Epidinocarsis* Girault but differing in the opaquely alutaceous sculpture and abundant white pubescence of the mesonotum.

Female: Head thinly subhemispherical, a little broader than long, thickest just above the anterior corners of the eyes; as seen from the side the curvature somewhat more abrupt next to the mouth and more gradual towards the occipital margin; as seen from in front the cheeks converge slightly towards the rather wide mouth. Occiput moderately concave with the margin rather acute above; frontovertex about one fourth longer again than its width at the ocelli, noticeably but not greatly widening anteriorly; ocelli placed in a right-angled triangle, the posterior pair about twice their own diameter from the eye-margins and three times their diameter from the occipital margin; eyes rather broadly oval, more bluntly rounded at the anterior end, strongly convex and slightly protuberant, just touching the occipital margin posteriorly, the outer margins nearly straight; face very slightly inflexed at a point opposite the lower third of the eyes, the scrobes rather deep, slightly converging but not meeting above, the facial prominence between the antennae somewhat arched below and visible in side view of head, the oral margin prominently emarginate at the middle, with the sinus rounded; cheeks short or about equal to two-thirds of the