TWO NEW AMERICAN BEAN BRUCHIDS (COLEOPTERA)

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When Europeans first came to America they found agricultural Indians cultivating food legumes unlike those of the Old World and applied familiar names to them, or took up some of the Indian names. Thus there legumes came to be known as peas, or beans, or even peabeans in the English-speaking colonies, and as frijoles, or frejoles, in part of the Spanish area. Two hundred and fifty years later Linnaeus, in 1753, applied to three of them the scientific names which they now bear, *Phaseolus vulgaris*, *P. lunatus*, and *P. coccineus*. He gave India as the habitat of the first and Benghala of the second, and did not know the source of the third. These plants had then been so long established in cultivation in the Old World that their American origin had been forgotten.

Three hundred and sixty-six years after Columbus found American beans in cultivation in Cuba, Pierre Hippolyte Lucas first reported bruchid injury to them. "Haricots" from La Plata sent to him in the Paris Museum by Allard in 1858 were infested by what he called *Spermophagus semi-fasciatus* Schoenherr. The same insect was found in Brazilian beans at the Centennial Exhibition at Philadelphia in 1876 and was mistakenly identified as *Bruchus granarius* by C. V. Riley and as *Bruchus* sp. by John L. Leconte. It was described in 1885 by David Sharp as *Spermophagus* (*Zabrotes*) *pectoralis*. During the World War and soon thereafter it was found to have been distributed widely over the world in beans from tropical America, where it is an important economic insect. It does not appear certain that it has maintained itself elsewhere. Friedrich Zacher gave an extended account of the species in 1930 under its proper technical name, *Zabrotes subfasciatus* (Boheman 1833).

Three years after *Zabrotes subfasciatus* was reported as affecting American beans, Asa Fitch reported another and far more important species affecting beans at Providence, R. I., describing it in 1861 as *Bruchus fabae*. Thirty-one years later Riley and Howard established that this American bean bruchid is the species described from Louisiana in 1831 by Thomas Say as *Bruchus obtectus*. In 1905 it was referred by Schilsky to his new genus *Acanthoscelides* under a later spe-

cific name and listed in 1906 under its correct technical name, *Acanthoscelides obtectus* (Say). This name is in general use for the species, but owing to a curious error on the part of John Lawrence Leconte in 1870, followed by George Horn in 1873, it came to be known as *Bruchus obsoletus* Say (1).

Unfortunately Maurice Pic in 1913 catalogued the American bean bruchid as *Bruchus obsoletus*. Say and this error has been repeated by several recent authors, renewing the confusion of fifty years ago. (2)

At present *Zabrotes subfasciatus* and *Acanthoscelides obtectus* are the only known Bruchidae attacking American beans. *Phaseolus vulgaris* L., *P. lunatus* L., (3) *P. coccineus* L., and *P. acutifolius* Asa Gray.

As a result of the activities of the United States Department of Agriculture two other species of *Acanthoscelides* very closely allied to *A. obtectus*, like it of Neotropical origin, and living in American beans of the genus *Phaseolus* have been in the collection of the United States National Museum for several years. These are described here as *A. obreptus*, from *Phaseolus lunatus*, and *A. obvelatus*, from *P. vulgaris*.

But little can be learned regarding the habits of *Acanthoscelides obreptus* and *A. obvelatus* from the infested seeds available for examination. Each of these species finds food for several larvae in a single bean just as *A. obtectus* does. No eggs were found attached to the seeds, and probably they are laid free or with little cement substance, as is common in *Acanthoscelides*. The eggs of *A. obtectus* are laid free and loose in the pod or in crevices in broken beans, or loose among sto-

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(1) **Acanthoselides obsoletus** (Say 1831) is quite a different insect, well known in the eastern part of the United States, where it affects the seeds of **Cracca** (or **Tephrosia**) **virginiana** and other species of that genus, and it has never been found elsewhere or affecting other seeds.

(2) This is perhaps the most serious mistake found in Pic's Catalogue of the Bruchidae, a work which has placed every student of this group under a debt of gratitude to M. Pic. It is in general much more accurate than any other list of the family.

(3) The writer has recorded **Callosobruchus phaseoli** (Boheman) and **C. maculatus** (Fabricius) (under other names) as reared from **P. lunatus** in Hawaii, but these records were based on single rearings of a very few depauperate individuals from a peculiar subspontaneous variety of **P. lunatus** with brown-marked white seeds. It is believed that the broad statement made is true for the economic varieties of the lima bean.

red beans, and the larva must find some point of support to secure purchase to enter the bean. The ripe pod is attacked in the open and the eggs inserted by the female through a crack; or, if no opening is found, she cuts an opening with her mandibles and inserts the eggs through it into the pod. Probably *A. obreptus* and *A. obvelatus* do the same. The firm, sharp-pointed ovipositor of *A. obreptus* might be supposed to be a piercing organ, but, more likely, it is merely a little more useful implement for inserting the eggs into existing openings or those made by the female. Probably neither species will be found limited to the known host plants and we cannot hope that either species will be found remaining in the known regions of distributution. Probably they will be found able to extend their range outside the tropics as *A. obtectus* has done.

The writer has studied intently the descriptions of more than a hundred Neotropical Bruchidae to determine if the two species described as new may have been described previously, but he admits he has no assurance that they have not. No description considered has seemed similar to that of *A. obvelatus* but many read so much like descriptions of *A. obreptus* as to be confusing. None of the types of these descriptions are in the United States; they are widely seattered in European collections and not available for study.

Bruchus leguminarius Gyllenhal 1833, described from Chile, has been considered a synonym of *A. obtectus* but this seeems very doubtful and the description seems more like that of *obreptus* and possibly it may be this species. The pronotum, however, is described as transverse, the hind femur is said to have only a small tooth (without denticle), and thre are ather discrepancies which seem to forbid this reference.

No other Neotropical species described in Schoenherr 1833 and 1839 can be either species here described.

None of the Chilean species described by Blanchard in Gay 1851 can be either species.

Jekel 1855 described *Bruchus paleatus* from Brazil and the description reads much like a description of *A. obreptus*. It is compared with his new species *B. dominicanus* and with *obtectus* but. I should infer that its antennae and protorax are more like those of *dominicanus* and it may be more closely allied to that species. If the recent interpretation of *dominicanus* as the species widely distributed in Neotropical America affecting the seeds of dividivi (*Caesalpina corsaria*) is correct and *paleatus* is allied to it, it cannot be *obreptus*

and should be excluded from *Acanthoscelides* when that genus is properly restricted.

None of the Chilean species described in 1859 and 1864 by the Philippis seem to be either species.

It is possible that some one of several reddish Neotropical species imperfectly described in the posthumous Motschulsky paper of 1874 is *obreptus* but none of the 18 descriptions studied fully applies to it.

From the description, *Acanthoscelides* insolitus (Sharp 1885), described from Guatemala, is a somewhat similar species but would seem to have a narrower conical prothorax and the antennae said to be short and stout. None of the descriptions of ather species by Shary in the Biologia Centrali-Americana can refer to cither species.

More than eighty descriptions of Neotropical Bruchidae by Maurice Pic have been studied cerfully and it may be that some one of the reddish species briefly characterized is in fact *obreptus;* but, if so, no mention is made of characters by which I could recognize it. Species of Bruchidae with suffused reddish and blackish coloration usually vary so much within the species that it is perhaps impossible to recognize them by color descriptions alone. Detailed descriptions of structure. antennae, legs, and especially the hind legs, are needed.

Thus the description of *Bruchus armitagei* Pic from Colombia would seem to apply fairly well to *obreptus;* but if Bondar 1937 is correct in identifying *armitagei* as the *Acanthoscelides* which has gone over from its unknown original American host plant to affect, the cultivated Old World pigeon pea (*Caganus cajan* or *indicus*), it is a species of which abundant material has been available for study. It is widely distributed over the Neotropical region and is of economic importance as attacking an important tropical food and forage plant. This species has been identified by Zacher 1936 as *Bruchus subroseus* Motschulsky 1874, though Bondar 1837 applies that name to a supecies affecting some unidentified host. This species resembles *A. obreptus* in coloration, but the front is ditinctly carinate, the antennae are stuter and more expanded, with the outer joints transverse, tho pronotum, elytra, and pygidium are more convex, the pronotum is not ampliate and is distinctly more narrowed conically, and the hind tibia is stouter with the subdorsal teeth much longer and longer than the lateral tooth. It can be mistaken for no ather bruch'd affecting food legumes.

The grou of *Acanthoscelides obtectus* Say.

The recognition of *Acanthoscelides obtectus* Say and the two species here described, *A.obvelatus* and *A. obreptus*, will require a detailed descripción of the small group in *Acanthoscelides* which they form.

Moderate-sized *Acanthoscelides* about 3 mm. from the anterior margin of the pronotum to the apex of the elytra; black, sometimes with parts of the head, antennae, thorax, abdomen, legs, and elytra with suffused reddish coloration, generally variable within the species, the red coloration least in *A. obvelatus* and most extensive in *A. obreptus*, sometimes entirely replacing the black.

Head with short malar space, eyes moderately large, normally convex and projecting, emarginate for about two-thirds of their length, widely separated by the front, which is little convex and with frontal carina obsolete or at most represented by a simple, shining, glabrous line not widened above; temples short, abruptly declivous to the contraction, head very slightly contracted above, the neck produced behind for about the length of the eye. Antennae slender, about half the length of the body, but little sexually dimorphic; four basal joints slender, longer than broad, the rest but little compressed and expanded, not serrate; 5 and 6 gradually wider, obconic; 7—10 similar to one another, longer than broad, as long as broad, or at most slightly wider than lone; 11 short, ovate, pointed.

Pronotum nearly as long as broad, narrowed about one-half anteriorly, somewhat ampliate on the sides, abruptly narrowed near apex; posterior-lateral angles slightly projecting; posterior margin transverse and depressed between lateral angles and median lobe; median lobe set off by an emargination on either side, submarginate in the middle and longitudinally impressed; dorsum otherwise nearly even, rather flattened and not much bent down in the middle; anterior angles (located by two tactile bristles) obsolete, strongly bent down toward the coxae; flanks narrow, nearly vertical, the lateral margin obsolescent, a mere raised line not visible without the removal of the coarse appressed protuberence.

Scutellum (as seen with the pronotum closely applied) very slightly broader than long, parallel sided, emarginate and bidentate at apex, concealed by dense whitish or ochraceous appressed pubescence. Elytra but little wider at base than pronotum and more than twice as long, ampliate on the sides, widest near middle, flattened on disc, microserrulate at apex of suture, broadly separately rounded, without tubercles at base; striae 5 and 6 abbreviate at apex and joined; striae

but little impressed, with punctures elongate, well separated, but little apparent in unrubbed individuals; intervals flat, alternately wider and narrower, with series of a few not very coarse punctures; pubescence in alternate pattern, suture and interval I concolorous, interval 2 pale, interrupted with short dark marks at basal and apical thirds, the alternate pattern laterally often ill defined dark and pale; humeri not strongly elevated, finely coriaceous, outer interval much widened on the epipleural lobe; pygidium oblique, nearly plane in the female, a little longer than broad, the sides arcuate, moderately rounded at apex, more convex in the male, bent down in the apical third and slightly reflexed; sterniters 2—4 of equal length, together longer than 1 behind the coxa, sternite 5 a little longer than 4 in the female, shorter in the male but not distinctly emarginate and no sclerite visible between pygidium and 5th sternite.

Hind femur compressed, not very strongly incrassate, as wide or not quite as wide as the coxa, its lower margin flattened but not channelled; inner margin bearing near apex a strong suberect tooth and beyond it two strong denticles (a third denticle sometimes present); margin before the tooth feebly serrulate; outer margin not carinate, sinuate before the small, rounded, condylar lamina. Hind tibia abruptly bent at base, outer face with ventral intermediate and lateral longitudinal carinae; ventral carina strongly elevated, ending in a slender, acute mucro about one-third as long as apical tibial width; intermediate carina obsolete at apex; lateral carina ending in a triangular lateral tooth about half as long as the mucro; apex with two or there short ann small subdorsal teeth much shorter than the lateral tooth. Hind tarus about as long as tibia; first joint slightly arched, with a strong ventral and a strong outer longitudinal carina, the ventral carina not produced into a tooth beneath the second tarsal joint; second tarsal joint parallel sided, with a carina beneath; tarsal lobes feeble, not expanded; ungues appendiculate.

Ovipositor of female elongate, when extended about as long as abdomen, strongly sclerotized and modified in *obreplus*.

Aedeagus of male with tegmen cleft, with the lobes expanded apically, bearing processes for muscular attachment at base of dorsal portion, ventral strut in a long horizontal triangle; median lobe with a ventral cap piece pivoted on each side into the sclerotized apex, elsewhere membranous with but little sclerotization; internal sac with the middle portion lined with innumerable sclerotized spicules and some

thin plates toward base, without conspicuos, strongly sclerotized plates or spines, the concealed apical sclerite of male abdomen not membranous, sclerotized.

The following key will perhaps assist in distinguishing these species.

Key to the obtectus group of Acanthoscelides

Antennae, legs, and pygidium entirely reddish; ovipositor of female strongly sclerotized, ending in two closely applied, spinelike processes, margin before the apical narrowing with a dentiform tubercle on each side .... *obreptus, new* species.

Antennae dark in the middle, ovipositor of female neither strongly sclerotized at apex nor acute 2

2. Antennae dark except at base beneath, joints longer than broad; pygidium and hind legs (usually) dark .... *obvelatus, new* species.

Antennate with apical joint red, joints 7—10 broader than long; hind legs red except along lower margin of femur, pygidium red .. .. *obtectus* Say.

Acanthoscelides obtectus (Say)

Certain peculiarities of coloration make *Acanthoscelides obtectus* one of the easiest Bruchidae to recognize. It is a blackish insect with an alternate pattern of fuscous and cinereous pubescence on the elytra, the apical margin of elytra often with the integument pale; the antennae are reddish at base and the apical joint is red; the legs are red except for the black lower edge of the hind femora, and the pygidium, and often the entire abdomen beneath, is red. Joints 5—10 of the antennae are usually black, at least above, and 8—10 are broader than long. Some lots of *obreptus* may be found in collections confused with *obtectus*, but in that species the antennae are much more slender, and I have never seen them with the middle portion of the antennae black or with any of the joints broader than long. In *obvelatus* the antennae are apparently never red at apex and no individuals seen have the abdomen red.

To the list of synonyms of *Acanthoscelides obtectus* published United States Department of Agriculture Technical Bulletin 593, pages 4-5, should be added Mylabris acupuncta Baudi 1886, *Mylabris leguminaria* Baudi 1886, and *Bruchus auberti* Perris 1874.

This species seems now to have been spread by commerce and established everywhere that *Phaseolus vulgaris* is extensively cultivated. Although it is by origin a tropical insect it has been able to maintain itself indoors in climates with exceedingly frigid winters.

Acanthoscelides obreptus, new species

(The lima-bean bruchid)

Reddish testaceous, with antennae and legs usually entirely pale, the head, elytra, and body variously black or suffused with blackish. In the most rufescent individual seen only the eyes, sterna, area on flank adjacent to front coxa, part of the metepisternum and a little of the first sternite between the coxae, the scutellum, palpi, apices of mandibles, ungues, and a little of the apex of hind tibiae are black or blackish. In a strongly melanistic individual most of the head (except the neck), most of the prothorax (except vague spots), most of the elytra (except spots near the humeri and a discal stripe), almost all the thorax beneath, and the abdomen (except the sides of the sternites), a large blotch on the pygidium, all the coxae, middle femora at base, hind femora and tibiae beneath, and even apical rings on some antennal joints are black or blackish.

Surface above densely covered with appressed golden whitish and fuscous pubescence concealing color and sculpture, in alternating pattern on the elytra. In rufescent individuals the pattern is but little contrasting. In melanistic individuals some of the pubescence on the blackish areas may be fuscous. The pubescence of the pygidium is dense and so disposed, particularly in the female, so as to give a semblance of longitudinal carinae.

Antennae slender, but little compressed and expanded, almost filiform, a very little more expanded in the female so that joints 7—10 are as broad as long and in the male a very little longer than broad.

Front about as broad as the eye, flat, not carinate, the pubescence converging toward the middle line.

Fifth sternite a little longer than the fourth in the female, about as long in the male.

Ovipositor elongate, the lateral components sclerotized, closely applied to each other in the middle line, and narrowed at apex into an acute point, the outer sides parallel at base and converging nearly evenly toward apex; where the convergence begins there is a marginal dentiform tubercle.

This modified ovipositor is elongate as in *obtectus* and *obvelatus* but otherwise very unlike, since the same part in these species is very little sclerotized. It is unlike the structure of any other bruchid known to me except one species not closely allied which has the acute sclerotized points but not the lateral tubercles.

Described from a series of more than 150 individuals, almost all of them reared from the seeds of *Phaseolus lunatus*, and recorded from the fillowing localities:

México: Acaponeta (Nayarit), J. N. Rose, 1897; from beans in baggage from Central Mexico, intercepted at San Ysidro, Calif., J. A. Altstaetter, 1935; San Cristóbal (Chiapas), Souviron and Erlanson, 1931.
Guatemala: Baranguillo (Guatemala), Wilson Popenoe, 1920: Guatemala City, Jorge García Salas, 1823; Nuevo Progreso (San Marcos), Ad. Tonduz, 1921.
Panamá: Summit (Canal Zone), J. E. Higgins, 1932.
Trinidad: Port of Spain, Fairchild and Dorsett, 1932.
Venezuela: Colonia Mendoza (Merida), C. H. Ballou, 1938; Misinta (Merida), Ballou, 1938.
Colombia: Cartagena, intercepted at Washington, D. C., G. A. Weigel, 1918.
Perú: Intercepted at New York, Lennox, 1937.
Chile: Communicated by Dr. Carlos E. Porter as sent to him by Sr. Gabriel Olalquiaga, January, 1939.

Acanthoscelides obvelatus, new species.

Blackish, joints 1—4 of antennae beneath, front legs more or less, and middle legs more or less red or suffused with reddish (sometimes almost entirely black), hind legs entirely black (or, sometimes, with a red mark on femora above toward the knee and the tibia sometimes reddish in part); clothed above with irregularly disposed, appressed, whitish and fuscous pubescence, in alternate pattern on the elytra which is not very dense and reveals the color and sculpture of the surface; pronotum with a pale longitudinal line and other whitish pubescent markings that are often but little evident.

Front flat, not carinate, not quite so broad as the eye. Antennae nearly alike in the sexes, slender and longer than head and thorax together, all the joints longer than broad, basal four joints slender, 5—7 gradually wider, 7—10 alike and not serrate, 11 much longer than broad, pointed at apex.

Pygidium oblique, broadly rounded at apex, a little longer than broad, unevenly clothed with coarse, appressed, ye-

llowish pubescence, interspersed with denudate, coarsely punctured, black areas; pubescence in middle line more or less continuous, appearing subcarinate; surface nearly plane in the female, shorter and more convex and more nearly vertical and reflexed at apex in the male; fifth sternite longer than fourth in female, somewhat abbreviated in male. Aedeagus shorter than in *obtectus;* apex of median lobe and apical lobes of tegumen much more expanded. Ovipositor similar to that of *obtectus*, elongate and narrowed apically but not strongly sclerotized or spinose at apex.

Described from a series of individuals taken at quarantine at Washington. D. C., from seeds of several varieties of *Phaseolus vulgaris* purchased in the market at San Cristobal, Chiapas, Mexico, by Souviron and Erlanson in 1931.

A single female reared from beans from Mexico by W. F. Howard on August 13, 1923, at Birmingham, Ala., resembles the present species except for the shorter and broader antennal joints and may be abnormal, or perhaps represents another species of the present group.