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**TWO NEW AGRICULTURAL PEST SPECIES
OF *CONOTRACHELUS*
(COLEOPTERA : CURCULIONIDAE : MOLYTINAE)
IN SOUTH AMERICA**

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Key words : life histories, parasitoid, *Urosigalphus venezuelaensis*, *Cholomyia acromion*, *Eugenia stipitata*, arazá, *Myrciaria dubia*, camu-camu, *Myrtaceae*.

Résumé. – Deux nouvelles espèces de *Conotrachelus* (Coleoptera : Curculionidae : Molytinae) nuisibles à l'agriculture en Amérique du Sud. – Deux nouvelles espèces de *Conotrachelus* du Pérou sont décrites. Les habitus et les genitalia des mâles des deux espèces sont figurés. Des notes sur leur biologie et des informations sur la bionomie de leurs plantes-hôtes cultivées (arazá, *Eugenia stipitata* et camu-camu, *Myrciaria dubia*) sont données. *Conotrachelus deletangi* Hustache est considéré comme synonyme plus récent de *Conotrachelus umbrinus* Fiedler (syn. nov.**).**

Abstract. – Two new species of *Conotrachelus* from Peru are described. Illustrations of their habitus and of pertinent parts of their genitalia are provided. Notes on their biologies and bionomic information regarding their agricultural host plants (arazá, *Eugenia stipitata* and camu-camu, *Myrciaria dubia*) are included. *Conotrachelus deletangi* Hustache is treated as a junior synonym of *Conotrachelus umbrinus* Fiedler (syn. nov.**).**

Conotrachelus Dejean is one of the largest genera in the world with more than 1,100 species considered to be valid. This New World genus which is concentrated in the Neotropics, and its species with their synonyms are all listed in O'Brien & Wibmer (1982) & Wibmer & O'Brien (1986). By far the majority of the species (more than 900) were described by Fiedler, in his monograph (1940) and in several other works by him (1944, 1952, 1954 a-b).

Quite a few of these species are economically important due to their attack on commercially and privately grown fruits. Examples include the "plum curculio", *Conotrachelus nenuphar* (Herbst) a major pest of plums, apples and peaches in North America and *C. psidii* Marshall which attacks guayava in South America. Both of the new species described herein are economic pests of South American fruits (in "Amazonia").

Abbreviations. – The following codens are used to indicate the collections in which specimens are deposited :

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ARC	Alexander Riedel Collection, private, Friedberg, Germany.
BMNH*	The Natural History Museum [formerly British Museum (Natural History)], London, England.
CMNC	Canadian Museum of Nature Collection, Ottawa, ON, Canada.
CWOB	Charles W. O'Brien Collection, private, Florida A & M University, Tallahassee, FL., USA.
FSCA	Florida State Collection of Arthropods, Division of Plant Industry, Gainesville, FL., USA.
INPA	Instituto Nacional de Pesquisas da Amazônia, Manaus, Brasil.
MNHP	Muséum National d'Histoire Naturelle, Paris, France.
ORST	Antenne ORSTOM, Muséum National d'Histoire Naturelle, Paris, France.
UNALM	Universidad Nacional Agraria La Molina, Lima, Peru.
USNM	U.S. National Museum of Natural History, Washington, DC., USA.

TAXONOMY

Conotrachelus eugeniae O'Brien, sp. n. (figs 2, 4, 5, 8, 9)

Type material. – **Holotype male**, Peru : Loreto : Iquitos, Centro Experimental El Dorado INIAA, adults on fruits of *Eugenia stipitata*, 20-VIII-93, *G. Couturier*, *R. Cardenas* & *E. Tanchiva* col. (MNHP). **Allotype female**, [same data] (MNHP). **Paratypes** 58 ex. : [same data] (ARC, 1 ex. ; CMNC, 1 ex. ; CWOB, 5 ex. ; FSCA, 1 ex. ; BMNH, 1 ex. ; MNHP, 6 ex. ; ORST, 4 ex. ; UNALM, 1 ex. ; USNM, 1 ex.) ; [same locality, except] plante-hôte *Eugenia stipitata* (Myrtaceae), 15-II-92, em. i.p. 15-V-92, *G. Couturier* col. (CWOB, 1 ex.) ; [same locality, except] host plant *Eugenia stipitata* (Myrtaceae), em. i.p. 5-V-92, *G. Couturier* col. (MHNP, 1 ex.) ; [same locality, except] host plant *Eugenia stipitata* (Myrtaceae), 19-III-92, em. i.p. 15-V-92, *G. Couturier* col. (CWOB, 1 ex. ; MNHP, 1 ex.) ; [same locality, except] host plant *Eugenia stipitata* (Myrtaceae), 20-X-91, *G. Couturier* col. (CWOB, 3 ex. ; MNHP, 3 ex.) ; [same data except] 9-XI-91 (CWOB, 2 ex. ; MNHP 3 ex.) ; [same locality, except] plant. El Dorado, ex larvae in fruits *Eugenia stipitata* (arazá) (Myrtaceae), 8-8-1992, *G. Couturier* & *E. Tanchiva* col. (ARC, 1 ex. ; CMNC, 1 ex. ; CWOB, 4 ex. ; FSCA, 1 ex. ; BMNH, 1 ex. ; MNHP, 4 ex. ; UNALM, 1 ex. ; USNM, 1 ex.) ; [same locality, except] estación IIAP Quistococha, plante-hôte *Eugenia stipitata* (Myrtaceae), 14-XII-91, *G. Couturier* col. (CWOB, 1 ex. ; INPA, 1 ex.) ; [same locality, except] plantación Endeselva, host plant *Eugenia stipitata* Myrtaceae, 15-XI-91, *G. Couturier* col. (CWOB, 2 ex. ; MNHP, 3 ex.) ; [same locality, except] Quistococha, host plant *Eugenia stipitata* (Myrtaceae), 7-II-92, i.p. em. 15-V-92, *G. Couturier* col. (CWOB, 1 ex.)

Description. – Body medium-sized (3.90-5.00 mm) ; short, broad-oval, robust ; cuticle reddish to reddish black ; moderately densely to densely clothed with round to slender, recumbent, white, and pale tan-brown scales ; prothorax with erect scale-like fascicles, and elytra with sparse erect scale-like setae.

Holotype male. *Rostrum* as long as prothorax (1.00) ; moderately slender, moderately evenly curved dorsally, subgibbous at base between eyes ; weakly evenly curved ventrally ; in middle 1/2 with medial longitudinal broad carina ; clothed on sides with moderately dense, elongate to oval, scale-like, white, and tan setae ; with widely scattered, sparse, suberect to erect, scale-like, white, and tan setae ; suprascrobal area broadly shallowly grooved, moderately coarsely, moderately densely punctate, and shagreened, remainder smooth and shining. *Head* moderately convex, densely subrugosely punctate ; punctures nearly concealed by dense, subcontiguous, elongate, recumbent, white, and tan, scale-like setae, oval and contiguous only along margin of eye. *Frons*

* For reason of common practice, the authors prefer to maintain the original coden.

moderately broad, broadening strongly from middle to dorsal margin of eyes ; flat, lacking fovea or sulcus ; clothed with moderately dense, not contiguous, round, white, and tan scales. *Antennae* inserted near apical 1/4 (0.27).

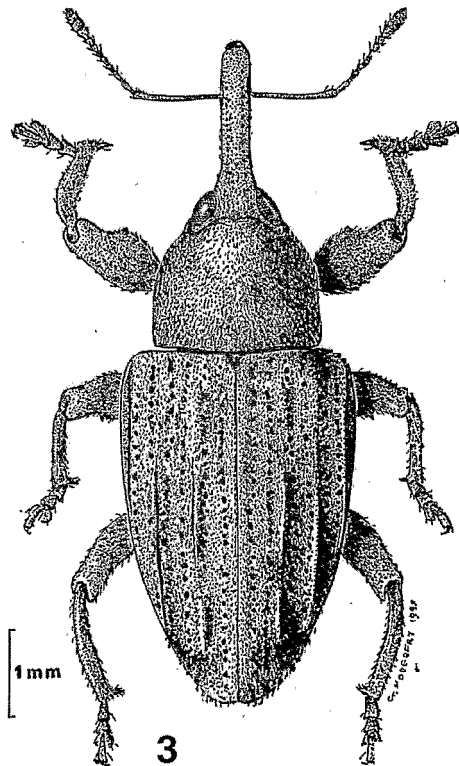
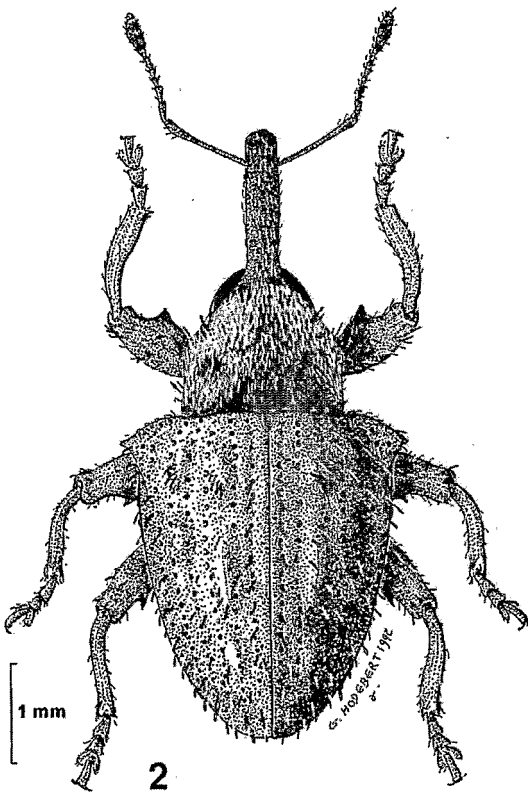
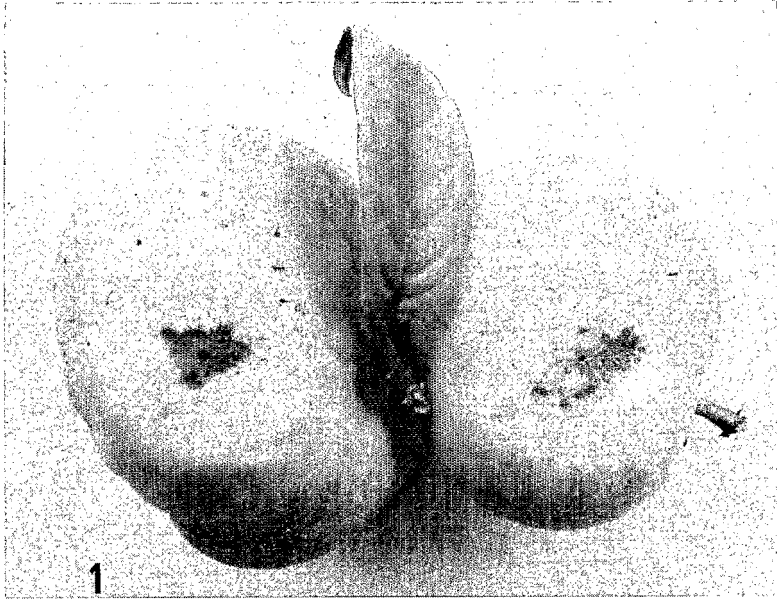


Fig. 1, fruit of *Eugenia stipitata* with typical larval damage.
Fig. 2 - 3, habitus drawings. - 2, *C. eugeniae*, male. - 3, *C. dubiae*, female.

Prothorax transverse, widest at base, there suddenly narrowed, sides subparallel to apical 1/3, there acutely angled and obliquely narrowed to apex; base strongly bisinuate; disc convex, strongly gibbous near middle, with pair of short submedian transverse carinae near posterior margin of gibbosity; with median longitudinal carina on apical 1/2 of gibbosity anterad to near apex; clothed with recumbent, round, oval, and narrow scales, most white, few tan, apico-lateral 2/3 with larger, round, imbricate, white setae; with white, narrow, oblique fasciae from gibbosity to hind lateral margins; with posterior subtriangular area behind gibbosity to hind margin with moderately sparse, narrow, white, and tan scales and two similar, small, sublateral, posterior spots; gibbosity, transverse carinae, acute side margins, and apex with fascicles of erect long coarse setae; and with sparse, widely separated, erect, long, coarse setae.

Scutellum broad-oval, with few coarse punctures, each with rather fine scarcely evident pale recumbent seta.

Elytra subtriangular; markedly wider than prothorax; humeri obliquely angulate, with anterior margin weakly convex, apex sharply acute and strongly projecting; odd-numbered intervals with well-separated tubercles, carinae or murications; interval 3 with small subbasal subcarinate tubercle, strong short submedian carina, and small subapical tubercle on declivity; interval 5 with very small subbasal tubercle and scattered small murications behind to declivity, and with similar murications on interval 7; interval 9 strongly unevenly carinate behind humeri to near apex; even-numbered intervals flat; all intervals with evenly placed row of erect to suberect, coarse, white or tan setae; tubercles and carinae with poorly defined fascicles of erect, coarse setae; surface clothed with dense, subcontiguous, elongate-oval, narrow, recumbent, tan, and few white scales; lacking striae grooves; striae punctures shallow, nearly concealed by elongate-oval, recumbent whitish scales; lacking distinct color pattern.

Mesosternum shallowly broadly concave; subtriangular, apex truncate, base broadly emarginate with lateral angles projecting anteriorly, densely clothed with elongate recumbent coarse white setae. *Metasternum* medially weakly impressed, sides and basal margin coarsely punctate, with rather sparse recumbent coarse white setae and few white scales, remaining area impunctate and subglabrous.

Abdominal sterna 1 medially flat, coarse punctures restricted to basal and apical margins, each puncture with suberect fine to moderately fine seta, remaining area shining and nearly impunctate with sparse suberect very fine setae; 2 medially flat and shining, with submedian transverse row of suberect coarse setae, and basal sparse fine setae; 3 and 4 shagreened, with submedian transverse row of suberect coarse setae, and very few scattered fine setae; 5 slightly undulate, shining, with unevenly distributed recumbent fine and suberect coarse setae, and with pair of long lateral subapical rather fine suberect curved setae; 1 ca. 2.40 X as long as 2; 2 ca. 0.75 X as long as 3 and 4 together; 5 ca. 1.30 X as long as 3 and 4 together.

Legs moderately short, stout; femora strongly clavate, acutely unidentate, tooth large; front femora nearly completely clothed with recumbent, imbricate, white, and few tan scales; basal 1/2 of middle and hind femora with moderately dense not contiguous elongate recumbent tan to brown scales, apical 1/2 with mix of tan and white scales, biannulate with imbricate white scales; all femora with suberect, coarse, white, and tan setae; tibiae moderately stout; fore tibiae bisinuate on inner margin, strongly expanded in apical 1/2; metatibial uncus simple, slender and acute; all tibiae with dense, contiguous to imbricate, elongate, tan scales; tarsal claw with stout long tooth near middle of claw. *Length* Pronotum and elytron: 4.40 mm.

Genitalia and associated structures. See figs 8, 9.

Allotype female. — Same as male except: *Rostrum* thinner and longer, slightly longer than prothorax (1.07). *Abdominal sternum* 1 very weakly concave, with punctures slightly denser and coarser. *Length* Pronotum and elytron: 4.90 mm.

Etymology. — This epithet is based on the name of the host plant genus, *Eugenia*, Myrtaceae.

Remarks and comparative notes. — This species keys to Group IV, Subgroup IV in Fiedler (1940) and is very close to *C. homonymus* Blackwelder (= *eburneus* Fiedler, not Champion) from which it can be separated readily due to the latter's uniform cream-

brown to ivory color. Another similar species is *C. umbrinus* Fiedler which can be distinguished by its broad, round to oval, recumbent, thoracic scales. A junior synonym of *C. umbrinus* is *C. deletangi* Hustache, **syn. nov.**, based on careful examination and comparison of both type specimens.

Biological notes. – This species was reared from, and adults collected on fruits of Arazá, *Eugenia stipitata* McVaugh. See notes below.

Range. – Known only from Peru, Loreto Department, Iquitos.

Conotrachelus dubiae O'Brien, sp. n. (figs 3, 6, 7, 10, 11)

Type material. – **Holotype male**, Peru : Loreto : Iquitos, Padre Isla, Plantación experimental San Roque, larvas en las semillas, Plante-hôte : *Myrciaria dubia*, 29-X-90, G. Couturier col. (MNHP). **Allotype female**, [same data] (MNHP). **Paratypes** 44 ex. : [same data] (ARC, 1 ex. ; CWOB, 3 ex. ; MNHP, 3 ex. ; BMNH, 1 ex. ; UNALM, 2 ex.) ; [same locality, except] Isla Muyuy INIAA/IVITA, host plant *Myrciaria dubia*, Myrtaceae, ex-larva, 8-I-92, G. Couturier col. (MNHP, 1 ex. ; [same data, except] 25-II-92 emergence of adult 15-V-92 (USNM, 1 ex.), 27-V-92 (CWOB, 1 ex. ; MNHP, 1 ex.) ; [same data, except] 25-II-92 (MNHP, 1 ex.), i.p. em. 18-V-92 (CMNC, 1 ex. ; CWOB, 1 ex. ; FSCA, 1 ex.), 29-V-92 (CWOB, 1 ex.) ; Iquitos, Padre Isla IVITA, plante-hôte *Myrciaria dubia* (Myrtaceae), 26-III-92, G. Couturier col. (MNHP, 1 ex.) ; [same locality, date, collector, except] host plant *Myrciaria dubia* Myrtaceae, i.p. em. 18-V-92 (CWOB, 1 ex.), 27-5-92 (CWOB, 1 ex. ; MNHP, 1 ex.), 29-V-92 (MNHP, 1 ex.), 22-VI-92 (CWOB, 1 ex.) ; [same locality, host, date, collector, except] ex-larva (MNHP, 2 ex.), ex-larva emergence of adult 18-V-92 (MNHP, 1 ex.) ; [same locality, host, collector, except] ex-larva, 10-X-91 (CWOB, 2 ex. ; MNHP, 1 ex.) ; [same locality, host, collector, except] ex-larva, 29-X-91 (MNHP, 1 ex.) ; Jenaro Herrera, "Centro de Investigación" IIAP, host plant *Myrciaria dubia* Myrtaceae, ex-larva, 19-I-92, G. Couturier col., emergence of adult 25-III-92 (MNHP, 1 ex.), 5-V-92 (CWOB, 1 ex. ; MNHP, 1 ex.) ; Ucayali : Pucallpa [8°25'S, 76°36'W] Plantation Cervezeria San Juan Carretera centrale km. 3.6, larves dans fruits de *Myrciaria dubia* (Myrtaceae), 24/26-X-1994, G. Couturier col. (CWOB, 4 ex. ; INPA, 1 ex. ; MNHP, 1 ex. ; ORST, 3 ex.).

Description. – Body medium-sized (4.80-6.20 mm) ; elongate-oval, moderately slender ; cuticle reddish brown to reddish black ; densely clothed with elongate to short-oval, recumbent, tan, brown, and cream-colored scales ; and with sparse to moderately dense, subrecumbent to suberect, scale-like setae.

Holotype male. *Rostrum* longer than prothorax (1.13) ; moderately slender, moderately evenly curved dorsally and ventrally, somewhat depressed at antennal insertion ; distinctly tricarinate, and with dorsal margin of suprascrobal groove subcarinate ; suprascrobal area coarsely densely punctate, and shagreened, with very small, recumbent, coarse setae ; remainder shining with dense punctures between carinae, each puncture with scale or coarse seta ; punctures very fine in apical 1/3. *Head* moderately convex, densely cribrately punctate ; punctures not concealed by moderately dense, recumbent, elongate scales. *Frons* moderately broad, *ca* equal to width of rostrum at base ; broadly impressed, with large deep median fovea ; with moderately dense, recumbent scales and setae directed towards fovea. *Antennae* inserted at apical 1/4 (0.25).

Prothorax transverse, sides subparallel from base to apical 3/10, there suddenly strongly constricted ; base strongly bisinuate ; disc weakly convex ; weakly subgibbous near middle, lacking median carina ; moderately densely to densely clothed with tan, brown, and cream-colored scales and setae, forming indistinct paler oblique fasciae from base to near apex, with subquadrate darker basal area behind gibbosity ; with moderately dense, subrecumbent, brown to cream-white, often indistinct, coarse setae.

Scutellum elongate-oval, U-shaped, apical margin projecting over base of prothorax, punctures nearly concealed by recumbent, dense, coarse, tan setae.

Elytra elongate-oval ; markedly wider than prothorax ; humeri subquadrately rounded, not projecting ; odd-numbered intervals carinate, at least in part ; interval 3 with carina twice interrupted, with short subbasal tubercle, separated from elongate median carina, separated from shorter declivital carina, not carinate to apex ; interval 5 with small subbasal tubercle, then carinate from basal 1/3 to declivity ; interval 7 evenly carinate from humeri to declivity ; interval 9 similarly carinate to near apex ; even-numbered intervals flat ; odd-numbered intervals with dense brown-black suberect setae on tubercle and along carinae, and few similar scattered white setae ; even intervals with two or three subrecumbent white setae on declivity ; all intervals with dense, recumbent, contiguous, oval, brown scales ; lacking striae grooves ; striae punctures moderately shallow, each with elongate recumbent pale coarse seta ; lacking distinct color pattern.

Mesosternum moderately concave, trapezoidal, narrowed posteriad ; base very slightly emarginate, with lateral angles broadly projecting antero-lateral ; densely clothed with elongate-oval, recumbent, coarse, tan setae. *Metasternum* medially weakly impressed, entire surface with widely scattered large moderately deep punctures, each puncture with fine recumbent seta, remaining area densely clothed with oval to elongate tan scales, sparser behind and towards middle ; obtusely angled between coxae, laterally declivous, and with small posterior tubercle over hind coxae.

Abdominal sterna 1 medially deeply broadly impressed from base to near apex, baso-lateral margin with sparse well-separated recumbent oval scales, median impression with moderately sparse recumbent scales and setae, remainder with dense subcontiguous to contiguous oval to elongate scales ; 2 medially flattened, with dense recumbent elongate to oval pale cream-colored scales and widely scattered subrecumbent coarse setae ; 3 and 4 with similar scales and setae, laterally dense, sparser in median 1/2 ; 5 with subquadrate median impression from basal 1/4 to apex, sides moderately declivous, with broad-oval recumbent moderately dense scales on basal 1/4, scales sparser and narrower apically becoming sparse setae only in apical 1/3 ; 1 *ca* 1.56 X as long as 2 ; 2 *ca* 0.86 X as long as 3 and 4 together ; 5 *ca* 1.81 X as long as 3 and 4 together.

Legs moderately long, stout ; femora clavate, unidentate, tooth small acute and with distinct apical carina to tibial insertion ; all femora densely to moderately densely clothed with elongate recumbent pale tan to cream-colored scale-like setae and scattered suberect similar setae ; tibiae stout ; fore – and midtibiae with inner margin bisinuate and outer margin strongly convex ; hind tibiae with inner margin straight and outer margin weakly convex ; metatibial uncus with acute elongate inwardly directed process and apex curled ventrally ; all tibiae with moderately dense recumbent elongate rows of pale scale-like setae and scattered suberect similar setae ; tarsal claw with short subbasal tooth. *Length* Pronotum and elytron : 5.60 mm.

Genitalia and associated structures. See figs 10, 11.

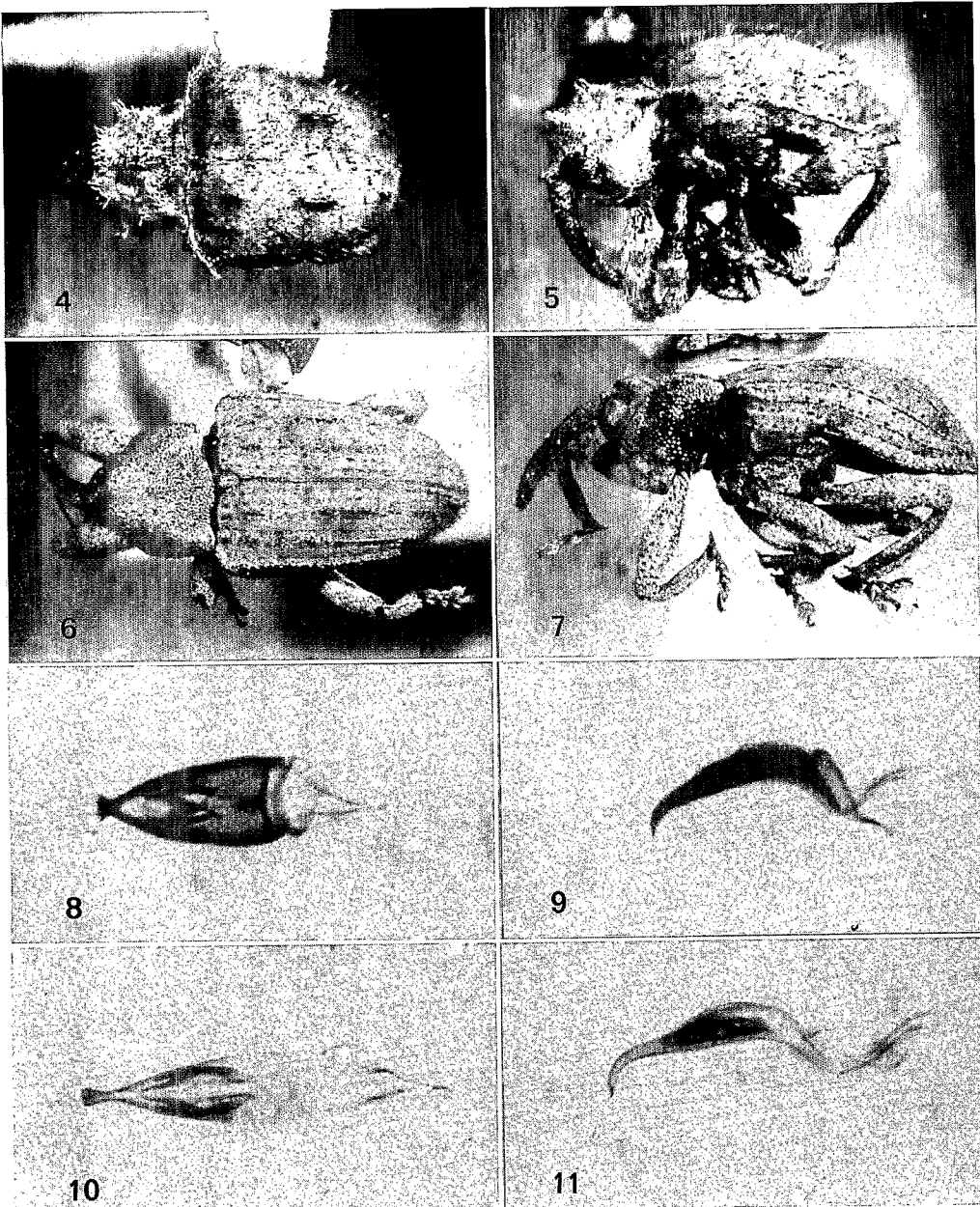
Allotype female. Same as male except : *Rostrum* longer than prothorax (1.33). *Abdominal sterna* 1 strongly transversely convex, medially with sparse fine recumbent setae ; sterna 2-4 medially with very sparse fine recumbent setae ; sternum 5 broadly transversely impressed in apical 1/3, nearly completely clothed with very sparse fine recumbent setae. *Length* Pronotum and elytron : 6.40 mm.

Etymology. – This epithet is based on the specific name of the host plant, *Myrciaria dubia*, Myrtaceae.

Remarks and comparative notes. – This relatively nondescript species keys to Group III, Subdivision II, Subgroup II in Fiedler (1940), but will key to no species in that group and is close to no other species known to us. It should not be confused with any other species known from the area, nor even from outside the region.

Biological notes. – Reared from fruits of camu-camu, *Myrciaria dubia* H.B.K. See notes below.

Range. – Peru, Loreto Department : Iquitos ; Ucayali Department : Pucallpa.



Figs 4-11, habitus and male genitalia photographs (dorsal and lateral views). - 4, 5, 8, 9, *C. eugeniae*. - 6, 7, 10, 11, *C. dubiae*.

BIOLOGICAL NOTES

Conotrachelus eugeniae O'Brien. - The host plant of *C. eugeniae* is *Eugenia stipitata* McVaugh, common name "arazá" in Peru and "araça boi" in Brasil. Arazá is an Amazonian shrub that also grows in the understory of not flooded forests of Peru and Bolivia (Cavalcante, 1976).

For 10 to 15 years, the Instituto Nacional de Investigación Agraria (INIA), and the

Instituto de Investigaciones de la Amazonia Peruana en Iquitos, (IIAP), Peru, and the Instituto Nacional de Pesquisas da Amazonia (INPA) in Manaus, Brasil, have grown *E. stipitata* experimentally to improve the yield and the quality of the production of fruits. It is cultivated also in some private orchards.

The fruit is a berry, yellow when mature, of 30 to 600 gr., which is used for jams and juices. It is very frequently sold in the local markets of Iquitos (Villachica *et al.*, 1990) and Manaus. Production can reach 28 t/ha (Pinedo *et al.*, 1981). Canned or bottled, it is a potential product for export. Reviews of information on arazá have been published by Chavez & Clement (1984) and Clement (1990).

Conotrachelus eugeniae is the most important pest of arazá in plantations. The adults are nocturnal and can be seen on fruits in which the females oviposit. The galleries of the larvae are characteristic and remind one of those of *C. psidii* on guayava (Orlando *et al.*, 1974). A few days after oviposition, the galleries form a dry black spot, hollow and pierced with many holes (fig. 1).

The larvae eat the pulp of the fruit and the epidermis of the seeds. There are one to fifteen larvae in a fruit. In case of large weevil populations, all the fruits can be infested. *C. eugeniae* attack all the stages of the fruit. If the oviposition occurs when the fruit is small (± 20 mm in diameter), it drops. When the fruit is more mature, the pulp is damaged and the growth is disturbed.

The duration of the development of the larvae is not known. The last instar larvae leave the fruit and drop to the soil. Under laboratory conditions (26–28°C), they burrow into the soil from five to ten cm in depth and can remain as larvae for three to eight weeks. They pupate for seven to eight days. *Eugenia stipitata* is the only known breeding host plant. *Conotrachelus eugeniae* is parasitized by the Braconidae *Urosigalphus venezuelaensis* Gibson, 1974, the percentage of parasitism is approximately 5% ; and by the Tachinidae *Cholomyia acromion* Wiedmann, 1824, whose percentage of parasitism is 5 to 10%. *C. acromion* is known as a parasite of *Conotrachelus* sp. near *curvicostatus* Marsh. in Brazil (Parker, 1953).

Conotrachelus eugeniae is a threat to the future cultivation of this fruit. Currently the best method of control is the systematic destruction of infested fruit.

Conotrachelus dubiae O'Brien. – The host of *C. dubiae* is the fruit of *Myrciaria dubia* H.B.K. (Myrtaceae). Locally named "camu-camu", *M. dubia* is a shrub that grows in the Amazonian basin, on the bank of rivers and lakes with black waters, where it is partially submerged during some months of the year (Peters & Vasquez, 1988). It forms important monocultures in some areas.

The fruit is a smooth, spherical berry of a 18 to 22 mm diameter, of a violet-red colour when mature, and contains one to three seeds.

As in the case of *E. stipitata*, *M. dubia* is cultivated for its fruits by INIA, IIAP and INPA and in private orchards. It has been introduced in south Florida, USA (Whitman, W.F., 1974). Its fruit contains a high percentage of vitamin C (Roca, 1965) and is used in some pharmaceutical preparations in the USA and Europe. It is very much appreciated locally for fresh juice, and is bottled for sale.

Conotrachelus dubiae appeared in one plantation near Iquitos in 1989, and is now found in some others.

There is only one larva in each fruit. The larva eats the pulp and the seeds. The infested fruit takes on a light brown colour and does not reach normal size. After it completes development the larva drops to the soil. As in the case of *C. eugeniae*, the larvae of *C. dubiae* burrow into the soil to a depth of about 10 cm and can remain as larvae for several weeks. The pupal stage lasts seven to eight days in laboratory conditions at 26–28°C.

No parasitoids have been obtained from this species. *Myrciaria dubia* is the only known host plant.

This species too must be controlled as it is a potentially dangerous pest for the future of this crop.

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LITERATURE CITED

- CAVALCANTE P.B., 1976. – *Frutas comestíveis da Amazônia*. Belem : INPA, 166 p.
- CHAVEZ F.W.B. & CLEMENT C.R., 1984. – Considerações sobre o araca boi *Eugenia stipitata* McVaugh, Myrtaceae) na Amazonia brasileira. – Comunicação técnica. Anais do VII Congresso Brasileiro de Fruticultura, 1 : 167-176.
- CLEMENT C.R., 1990. – Arazá. In : Nagy S., Shaw P.E., Wardowski, W.F. (eds), *Fruits of tropical and sub-tropical origin* : 260-265. Lake Alfred, Florida : Florida Science Source.
- FIEDLER C., 1940. – *Monograph of the South American weevils of the genus Conotrachelus*. London : British Museum (Natural History), v + 365 p.
- 1944. – Neue südamerikanische *Conotrachelus* aus der Sammlung Chevrolat's im Reichsmuseum in Stockholm (Col. Curc. Cryptorhynch.). – *Arkiv för Zoologi*, [1943], 35A : 1-63.
- 1952. – Neue *Conotrachelus* aus Südamerika (Col. Curc. Cryptorhynch.) (51. Beitrag zur Kenntnis der amerikanischen Cryptorhynchiden). – *Arkiv för Zoologi*, [1951], ser. 2, 3 : 1-17.
- 1954a. – Neue südamerikanische Arten der Gattung *Conotrachelus* Schönh. (Col. Curc. Cryptorhynch.) (43. Beitrag zur Kenntnis der amerikanischen Cryptorhynchiden), p. 90-137.
- 1954b. – Neue südamerikanische *Conotrachelus* aus dem National Museum in Paris (Col. Curc. Cryptorhynch.) (52. Beitrag zur Kenntnis der amerikanischen Cryptorhynchiden), p. 150-168 ; In : Neue südamerikanische Rüsselkäfer aus der Subfamilie Cryptorhynchini. Jena : Fischer Verlag IV, + 216 p.
- O'BRIEN C.W. & WIBMER G.J., 1982. – Annotated checklist of the weevils (Curculionidae *sensu lato*) of North America, Central America, and the West Indies (Coleoptera : Curculionoidea). – *Memoirs of the American Entomological Institute*, 34 : 1-382.
- ORLANDO A., SAMPAIO A.S., CARVALHO A. M. de, SCARANARI H.J. & ARRUDA H.V., 1974. – Notas sobre o "gorgulho das goiabas" – *Conotrachelus psidii* Marshall, 1922 (Coleoptera : Curculionidae) e experimentos de combate. – *O Biológico*, 40 : 281-289.
- PARKER H.L., 1953. – Miscellaneous notes on South American dipterous parasites. – *Bollettino del Laboratorio di Entomologia Agraria "Filippo Silvestri" Portici*, 12 : 45-73.
- PETERS C. & VASQUEZ A., 1988. – Estudios ecológicos de camu-camu (*Myrciaria dubia*) producción de frutos en poblaciones naturales. – *Folia Amazonica*, 1 : 83-98.
- PINEDO P.M., RAMIREZ N. & BLASCO M.L., 1981. – Notas preliminares sobre el arazá (*Eugenia stipitata*), frutal nativo de la Amazonia Peruana. Ministerio de Agricultura y Alimentación /INIAA/IICA. – *Publicación Miscelánea*, Lima, 229 : 1-58.
- ROCA N.A., 1965. – *Estudio químico-bromatológico de la Myrciaria paraensis Berg*. – Tesis Química, Universidad Nacional Mayor San Marcos, Lima, 51 p.
- VILLACHICA H., SILVA J.E., PERES J.R. & ROCHA M.C. da, 1990. – Sustainable agricultural systems in the humid tropics of South America. In : *Sustainable agricultural systems, Soil and Water Conservation* : 391-437. Ankeny, Iowa.
- WHITMAN W.F., 1974. – Three unusual tropicals : the camu-camu, the "wan" maprang and the "manila" santol. – Florida State Horticultural Society, 18th annual meeting : 375-379.
- WIBMER G.J. & O'BRIEN C.W., 1986. – Annotated checklist of the weevils (Curculionidae *sensu lato*) of South America (Coleoptera : Curculionoidea). – *Memoirs of the American Entomological Institute*, 39 : 1-563.