Tricorynus rudepunctatus (Pic) (Coleoptera: Anobiidae): diagnosis and damage

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Abstract

The objective of this research was to identify and study a species of Anobiidae that causes great damage and is a cause of concern as an urban pest in Brazil. This species has been found infesting wood, furniture, doors, books, insect collections, tea, dried fruits, handcrafts, and many other commodities. Inspections were done in houses and storehouses in the city of Curitiba, PR, Brazil in order to collect objects and materials that present signs of anobiid attack. The only species identified was *Tricorynus rudepunctatus* (Coleoptera: Anobiidae). There is only one reference to this species in the central region of Brazil. Another anobiid, the book pest *Tricorynus herbarius* has been recorded attacking books and historical documents and *Tricorynus* sp. attacking forest trees, but it was not recorded in our survey. Usually, the damage caused by *T. rudepunctatus* is mistaken with damage by termites; and when the insect is collected it is frequently misidentified as *T. herbarius* or as the cigarette beetle, *Lasioderma serricorne* or even as *Stegobium paniceum*, the drugstore beetle. Some morphological characters useful to identify *T. rudepunctatus* are: oval body about 2.7 mm long; dark brown with smooth hairs all over the body; head concealed under the pronotum; 10-segmented antenna with the three apical segments forming a 3-segmented loose club; elytra with two grooves at the posterior edge; fore femur with a transversal line on its anterior face; pro and mesotibia with two distinct striae; metasternum longitudinally carinate in the middle. Adults and larvae bore inside the materials, forming galleries and producing a coarse powder.

Keywords: Anobiids, Insect identification, Morphological characters, Urban pest.

1. Introduction

The members of the genus *Tricorynus* Waterhouse, 1849 (Coleoptera: Anobiidae: Dorcatominae) were previously included in the genus *Catorama* Guérin-Meneville, 1850. According to White (1965), the name *Catorama* was used for more than 100 years, however it was synonymized with the older name *Tricorynus*, which was described by G. R. Waterhouse in 1849, based on the type species *Tricorynus zeae* from Barbados Islands.

There are 131 species of *Tricorynus* described for the world in the genus, most of them occurring in the southwest United States; in Texas, New Mexico, Arizona, and California. The fauna from Central and South America has not been well studied and may contain many more new species of *Tricorynus*, as pointed out by Maurice Pic who described numerous species of Coleoptera from the Americas in the early 1900s. Since his descriptions were very brief and vague, most of Pic's names for the species of *Trycorinus* were lately reviewed and reassigned by White (1965, 1981).

The complexity of the taxonomy of the genus *Tricorynus* has been clearly demonstrated in the paper by White (1965). The author mentions that only about one third of the 6000 specimens loaned from North America could be determined at species level, and about 40% of them were misidentified. Eleven species of *Tricorynus* were mentioned by White (1981) as occurring in Brazil, as well as *Tricorynus herbarius* (Gorham, 1883) reported by Silva et al. (2004), but there have been no further studies on their distribution or bionomics.

There is a lack of references concerning the behavior and biotic associations among the species of *Tricorynus*. Most publications refer to *T. herbarius*, the Mexican book beetle, as an urban pest damaging books, leather, stored products, furniture and other wood goods. Another species, *Tricorynus tabaci* (Guérin-Méneville, 1850), is mentioned as an economically important pest feeding on tobacco seeds in the tropics (Peck, 2009).

Species of *Tricorynus* are usually confused with each other and with other anobiid genera and species such as the cigarette beetle *Lasioderma serricorne* (F., 1792) and the drugstore beetle *Stegobium paniceum* (L., 1761). People usually mistaken the damage by *Tricorynus* as that caused by termites.

The species *Tricorynus rudepunctatus* (Pic, 1904) is included among the species described by Pic from the county of Jataí, state of Goiás, in the Midwest region of Brazil, and reviewed by White (1981). In this paper, we identified the anobiid species causing extensive damage in southern Brazil as *T. rudepunctatus*. This species is a small brown beetle, oval in shape and with smooth hairs covering the body, morphologically similar with many other anobiids, which results in frequent misidentification. Similar to other members of the subfamily Dorcatominae, this species conceals head and appendices (legs, mouthparts, and antennae, except for the last antennal segment) under the body, allowing it to bore and hide in the wood and other materials.

The objectives of this study were to collect, identify and present morphological data about *T. rudepunctatus* found infesting and causing extensive damage in wood doors, furniture, books, insect collections, stored products, and other house goods in southern Brazil.

2. Materials and methods

Materials infested with anobiids were collected sporadically in houses and commercial buildings in the city of Curitiba, state of Paraná, southern Brazil, over two years. The insects were removed from wood (doors, furniture), straw chairs, crafts made with different materials, stored food (tea, soybeans, barley, packed foods), and insect collections (from the dead insect carcass and in the cork or foam plastic bottom). All collected material were taken to the laboratory and the insects were either pinned or fixed in 70% ethanol after being boiled in 20 volumes of oxygenate water. Adult specimens were dissected to analyze genitalia and different body parts. Vouchers were deposited in the Pe. Jesus Santiago Moure Entomological Collection (DZUP) of the Universidade Federal do Paraná.

Adults were dried and mounted on stubs and analyzed under electronic scanning microscope in the Electronic Microscopy Laboratory. Descriptions based on morphological characters observed by optical and scanning microscopy are presented as well as an adapted key based on White's (1981) key.

3. Results

All samples analyzed that were damaged by anobiids contained exclusively *T. rudepunctatus*. A detailed description based on external adult morphology analyzed by optical and scanning microscopy follows. Some larva characters are also given. Morphological characters and damaged materials are illustrated and a brief key contrasts adults of *T. rudepunctatus* with other *Tricorynus* species mentioned for Brazil.

Parasitoids in the Bethylidae family were recorded in our samples associated with this anobiid species; however, they are not considered good control agents because they sting painfully forming long lasting rash in people and domestic animals.

3.1. Description of T. rudepunctatus

3.1.1. Larvae (Fig. 1.)

They are C-shaped scarabaeiform, creamy white, integument is soft; head is distinctly sclerotized and hypognata. Body is subcylindrical, not particularly sclerotized, but with small dorsal hooks on most segments; three pairs of well developed legs with distinct claws. The head capsule is suboval and larger at the middle portion; there are many long setae and the area behind the epistome is well pigmented; the antennae are reduced without distinct segments; the stemmata are apparently absent. Mouthparts are well developed; mandibles with one or two teeth; lacinia lobed with two spines, about the same size as the galea, which is also lobed with strong spines at the apex; maxilar palps are claw like with three articles. Ten abdominal segments are present; thoracic and abdominal spiracles vary in shape and size. Pre-tarsus is sclerotized with setae; the claws are curved and the arolium may or may not be present.

Figure 1 Larva of *Tricorynus rudepunctatus*.

3.1.2. Adults (Fig. 2 a, b, c, d)

Small, about 2.7 mm, subcylindrical, oval almost globular beetles; reddish brown dorsally with head and abdomen slightly darker than metasternum; antennae, palps, and tarsi orange. Body covered with fine, silky hairs; dorsal cuticle with small punctures uniformly distributed mixed with sparse large punctures; large punctures are present on the head, laterally on the pronotum, on the elytra (sparse at the base), metasternum and abdomen.

Head is opisthognathus, deflexed under the pronotum, round with two rows of very close punctures usually coalescent. There is a distinct suture under the insertion of the antennae, this margin is carinate and extend diagonally towards the anterior margin of the eyes. Compound eyes large, round, well developed, but weakly bulging.

The antennae are 10-segmented with a loose 3-segmented club, sparsely pubescent, inserted right below the bases of the mandibles on the subocular suture. The first antennal segment is reddish brown punctuated and pubescent, triangular and twice longer than wide, larger at the apex; it is visible when the insect is resting. All the other antennal segments are yellowish; the second being much smaller than the first one, broadening towards the apex, length less than 2x the width. Segments 3 to 7 are cylindrical; some of them bear one or two long straight hairs. Segments 8 and 9 are triangular, broadening towards the apex, about the same size as the first one; segment 10 is large, narrow at the base and at the apex, and broad in the middle (Fig. 2 d).

The clypeus is distinct with an arcuate dorsal suture. The labrum is slightly reduced between the bases of the mandibles. The outer margins of the mandibles are arcuate, glabra and shiny, whereas the middle of the mandibles is depressed and pubescent. There are two teeth, the external is acute and the internal is obtuse. The maxillary palp is 3-segmented; the apical segment has parallel sides, 1.5 to 5x longer than wide. The labial palp is 3-segmented, with the apical segment triangular, 1 to 2x longer than wide.

The pronotum is hood like concealing the deflexed head, anterior margin distinct forming an almost straight angle with its laterals; the posterior margin is sinuous and may reach laterally the sides of the elytra. The pronotum is punctuated with larger punctures on the sides. The scutellum is triangular with narrow bases and arched sides. The prosternum is transverse, 5x wider than long, concave, and has a small ventral groove to hold the antennae. There is a fringe of long straight hairs and the coxal cavities are opened. The mesosternum is wide and horizontal, curved ventrally forming a hook like projection over the middle coxae separating them. The metasternum is carinate at the anterior third, and concave in the middle where a metasternal hook rests. There are large punctures on the central part.

The elytra cover the abdomen completely, with two distinct lateral striae or grooves on the elytral apex. The dorsal surface of the elytron is sculptured with punctures; the small ones are uniformly distributed, whereas the large ones are sparse on the bases and more distinct and closer together on the elytral apex. There are 9 or 10 rows of longitudinal yellowish striae along the surface of each elytron.

The legs are 5-segmented, uniformly covered with silky hairs. The first tarsomere is the longest, the other five are shorter and equally large. The fore coxae are triangular and contiguous; the middle and hind coxae are separated and transverse; the femur has a distinct transversal stria on the dorsum-anterior surface; the tibia is flat and has two grooves or striae.

The abdomen is five-segmented; the first segment is partially covered by the hind coxae and depressed laterally where the legs rest; the other four segments are distinct with straight or bisinuated sutures; there are uniform punctures on the surface.

The male genitalia is trilobed; the lateral lobes are curved externally, with toothed apices; the stylus is inserted laterally up to the middle portion; they are larger at the apex or about cylindrical and pubescent. The sides of the median lobe may be parallel, sinuate or narrow apically with long and sparse hairs laterally at the apex. The most important diagnostic characters of the male genitalia are the internal processes and the median lobe. The processes are either hook like or shaped as a tubercle; sometimes they bear two or three spines.

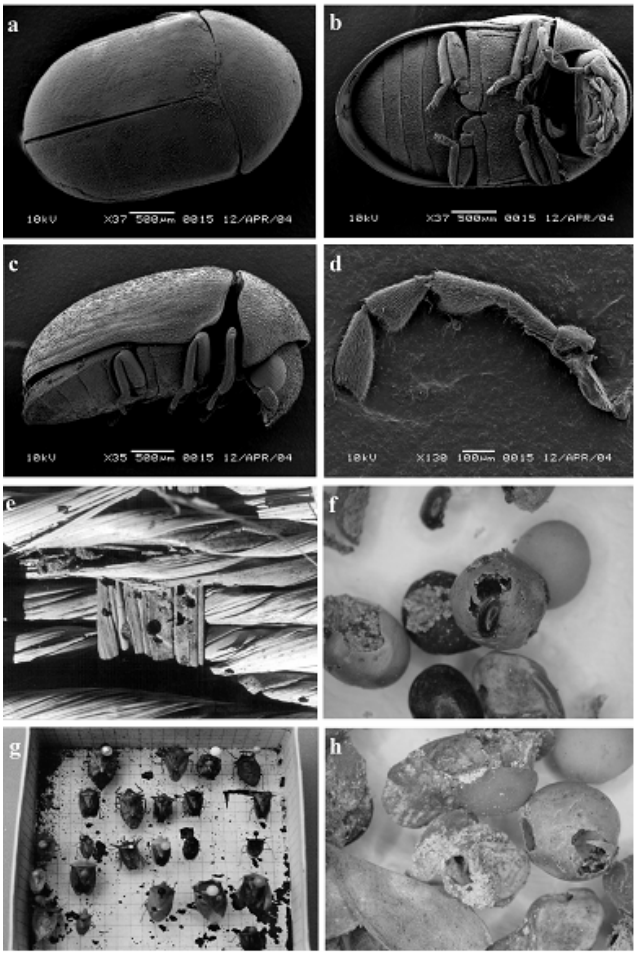

Figure 2 Adult of *Tricorynus rudepunctatus*: (a) dorsal view; (b) ventral view; (c) lateral view; (d) antenna. Damage caused by larvae and adults of *Tricorynus rudepunctatus* (e) straw; (f) soybean; (g) insects and cork bottom; (h) puparium formed with secretion holding damaged soybean seeds.

3.2. Damage (Figures 2 e-h).

Larvae and adults were found boring into the wood of doors and furniture, straw chairs and handcrafts, all sorts of grains, cereal and oil seeds, tea, dried fruits, and insect collection. They produce a coarse powder; the larva makes a pupal case with rest of materials glued together with a hard secretion.

4. Discussion

Our results showed that the identity of the anobiid species observed damaging wood, straw, and all sorts of stored materials in Curitiba, Paraná, is *T. rudepunctatus*. Thus, it has been erroneously assumed that the household damaging species in Brazil is exclusively *T. herbarius*, probably because reference collections and adequate descriptions are not available. There is only one reference to this species in Brazil – specimens from the state of Goiás, included in the Pic's material studied by White (1981).

Silva et al. (2004) reports the occurrence of the bibliophagous anobiid *T. herbarius* and presents biological data for this species reared on different diets. It was not possible to check the material studied by Silva to confirm the identification. The presence of *T. herbarius* was recorded in the libraries of Rio de Janeiro, São Paulo and Minas Gerais that hold many historical books (Guimarães, 1989). There are early reports on the attack of *T. herbarius* in books, mentioning those by Faria (1919), Sawaya (1955), Lelis (1980), and Carrera (1981).

The diagnostic characters of *T. rudepunctatus* are the metasternum rounded front to back, distinctly carinate at middle, eyes separated by about 1.7x vertical diameter of an eye, pronotum bulging above anterior margin, 9 or 10 rows of longitudinal yellowish striae along the surface of each elytron; it is usually smaller than *T. herbarius*. The main characters of *T. herbarius* that can be used to distinguish it from *T. rudepunctatus* are: metasternum not carinate, eyes separated by 1.8–2.4x vertical diameter of an eye, elytra with large punctures.

Based on the key by White (1981) for tropical species of *Tricorynus*, a brief key is presented below to distinguish among the 11 species he mentioned for Brazil plus *T. herbarius* mentioned by Silva et al. (2004).

Further studies are needed to determine taxonomic status, biological parameters bionomical data, and geographical distribution of *Tricorynus* species in Brazil. It is also necessary to establish effective and safe measures to control *Tricorynus* species attacking bibliographical materials, art pieces, furniture, and food in houses and public spaces.

All the 12 species assigned in the key are overall morphologically similar to most anobiids; they have 1 or 2 distinctly impressed lateral grooves at apical half of each elytron. Beyond this point, the species can be separate by the characters indicated in the key that follows.

1. Elytron with 1 of the lateral grooves distinctly impressed, or with lower groove stronger than the upper groove	2
- Elytron with 2 impressed grooves, about equally deep	4
2. Head just above eye with a deep, arcuate, transverse groove, pronotum with acute anterior angle, pubescence with a golden reflection, elytron at apex with a fine, impressed groove, above it with a stria of aligned punctures, length 3.7 mm.	*T. fulvopilosus*
- Not as above	3
3. Elytral apex at side with a 2nd upper groove, metasternum carinate at middle, large elytral punctures separated on an average by a little over diameter of a puncture, eyes separated by about 1.7x vertical diameter of an eye, pronotum at side bulging, length 3 mm	*T. distinctus*
- Elytral apex at side with but 1 groove, eyes smaller, weakly bulging, separated by nearly 2x vertical diameter of an eye, length 1.7-1.9 mm.	*T. unisulcatus*
4. Anterior tibia with 2 distinct grooves, metasternum distinctly, longitudinally carinate at middle, eyes separated by about 1.7x vertical diameter of an eye, pronotum bulging above anterior margin, body about 1.9 x as long as wide, metasternum rounded front to back, length 2.7 mm	*T. rudepunctatus*
- Tibia same as above; metasternum not carinate	5
5. Lateral elytral striae distinct at apex but not indicated at level of metasternum	
- Lateral elytral striae distinct at apex and weakly to clearly indicated at level of metasternum by shallow grooves or aligned punctures	6 9

6. Elytral apices distinctly produced, outline of elytral apex when see from above as a broad "W", eyes separated by 1.7x vertical diameter of an eye, pronotum at side inflated, length 2.3 mm — *T. caudatus*
- Elytral apices evenly round, otherwise not as above — 7

7. Pronotum at side with large punctures only, separated on an average by more than diameter of a puncture, small punctures absent, head with large punctures only, eyes separated by 1.5x vertical diameter of an eye, length 2.6 mm — *T. subplicatus*
- Pronotum at side not as above, head not as above, eyes separated by 1.6–2.0x vertical diameter of an eye — 8

The species *T. reitteri* and *T. minutissimus* share the following characters before they are separated by couplet 8: abdominal sutures not impressed, segments nearly flat front to back, punctuation at side of pronotum clearly to obscurely dual, length 2.0–2.4 mm, mesosternal hooklike process not produced, eyes smaller, weakly bulging, separated about 2x vertical diameter of an eye, punctuation at side of pronotum clearly dual, large punctures much larger than small punctures and denser.

8. Body primarily dark brown but with elytral apex, head, and abdomen more or less red brown, length about 2.4 mm — *T. reitteri*
- Body primarily red brown but with metasternum a little darker than remainder, length about 2.0 mm — *T. minutissimus*

9. Punctures of head clearly dual, of small, dot like punctures and larger, rimmed punctures, punctures at side of pronotum above anterior margin so dense that they are largely confluent — *T. brasiliensis*
- Punctures of head of one size, irregular in size, or obscurely dual — 10

The species *T. convexus*, *T. cribratus*, and *T. herbarius* share the following characters before they are separated by couplet 10: punctures at side of pronotum dual, distinctly impressed and clearly of 2 sizes.

10. Length about 4.0 mm, dark brown nearly throughout, apex of 5th abdominal segment narrowly produced — *T. convexus*
- Length about 2.4–3.5 mm, red brown nearly throughout, apex of 5th abdominal segment not produced — 11

11. Elytra with large punctures on disk showing no tendency to alignment in bands, eyes separated by 1.6x vertical diameter of an eye, length 2.8 mm — *T. cribratus*
- Elytra with large punctures on disk showing weak to distinct tendency to alignment in bands, large punctures of metasternum smaller, sparser laterally, not quite attaining side, metasternum behind anterior margin on each side of middle with a narrow, elongated fovea, eyes separated by 1.8–2.4x vertical diameter of an eye, length 2.7–3.5 mm — *T. herbarius*

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References

Carrera, M., 1981. História dos insetos inimigos dos livros. Ciência e Cultura 33, 353-360.

Faria, D., 1919. Os Inimigos Dos Nossos Livros. Serviço Sanitário do Estado de São Paulo, 38 p.

Guimarães, J.H., 1989. Ação dos insetos bibliófagos na degradação do acervo cultural gráfico. Anais do I Seminário sobre Preservação de Bens Culturais, São Paulo, pp. 51-67.

Lelis, A.T., 1980. Determinação, prevenção e conservação de documentos gráficos. Papel, Ribeirão Preto, pp. 55-60.

Peck, S., 2009. The beetles of Barbados, West Indies (Insecta: Coleoptera): distribution and faunal structure. Journal Insecta Mundi 73, University of Nebraska. pp. 1-51.

Sawaya, M.P., 1955. Observações sobre *Catorama herbarius* Gorh. (besouro bibliófago) e respectiva simbiose. Arquivos de Zoologia 8, 305-311.

Silva, C.R., Anjos, N., Serrão, J.E., 2004. Biologia da broca-do-livro *Tricorynus herbarius* (Gorham) (Coleoptera: Anobiidae) em duas dietas diferentes. Neotropical Entomology 33, 673 – 677.

White, R.E., 1965. A revision of the genus *Tricorynus* of North America (Coleoptera: Anobiidae). Miscellaneous Publications of the Entomological Society of America 4, 285 – 368.

White, R.E., 1981. A key to tropical species of *Tricorynus*, with taxonomic changes (Coleoptera: Anobiidae). Proceedings of Entomological Society of Washington 83, 772 – 784.