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New teratological examples in Neotropical Staphylinidae (Insecta: Coleoptera), with a compilation of previous teratological records

Nuevos ejemplos teratológicos en Staphylinidae neotropicales (Insecta: Coleoptera), con una compilación de registros teratológicos previos

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Abstract. Teratology is the study of malformations that affect various organisms and may cause taxonomic confusion. The goal of this work is to compile the previously published information about malformations in species of Staphylinidae, to describe 10 teratological cases that have not been previously recorded in neotropical species of this family, and to point out the high frequency of these malformations in the studied specimens. The previously recorded cases were obtained from review of 13 papers, and the studied specimens were obtained on loan from several collections. In total, 43 teratological cases were compiled for Staphylinidae, belonging to 39 species from 8 subfamilies. Ten teratological cases are described for specimens from *Belonuchus*, *Agrodes* and *Plochionocerus*. One of them occurs in *B. apiciventris*, 2 in *A. elegans*, 3 in *P. humeralis*, 3 in *P. fulgens* and 1 in *P. splendens*. Most of the anomalies affect the antennae (7 cases), but teratologies that affect mandibles (1 case), midlegs (1 case) and pronotum (1 case) are also presented.

Key words: anomalies, taxonomical confusions, staphylinids, *Agrodes*, *Plochionocerus*, *Belonuchus*.

Resumen. Teratología es el estudio de las malformaciones que afectan a distintos organismos y que pueden causar confusiones taxonómicas. El objetivo del presente estudio es recopilar la información previamente publicada sobre teratologías en especies de Staphylinidae, dar a conocer 10 casos de anomalías presentes en especies neotropicales de esta familia que no han sido reportadas con anterioridad, así como resaltar la alta frecuencia de estas deformaciones en los organismos estudiados. Los casos previamente reportados se obtuvieron de la revisión de 13 trabajos, mientras que los ejemplares estudiados proceden del préstamo de organismos de distintas colecciones. Se recopiló un total de 43 casos teratológicos para Staphylinidae, pertenecientes a 39 especies de ocho subfamilias. Se describen 10 casos teratológicos en ejemplares de *Agrodes*, *Plochionocerus* y *Belonuchus*, 2 de ellos se presentaron en *A. elegans*, 1 en *B. apiciventris*, 3 en *P. humeralis*, 3 en *P. fulgens* y 1 en *P. splendens*. La mayoría de las anomalías afectan las antenas (7 casos), pero también se presentan teratologías que afectan las mandíbulas (1 caso), mesopatas (1 caso) y pronoto (1 caso).

Palabras clave: anomalías, confusiones taxonómicas, estafilínidos, *Agrodes*, *Plochionocerus*, *Belonuchus*.

Introduction

Teratology is the study of structural abnormalities, especially monstrosities and malformations (Torre-Bueno, 1989). Balazuc (1948) defines it as the study of monsters. Monsters are specimens of a particular species with 1 or more exceptional anatomical particularities, incompatible with the generic characters or with characters of the suprageneric taxon to which the species belongs (Savini and Furth, 2004). The existence of teratomorph specimens in Coleoptera, as in other insects, may be due to alterations in the embryonic or postembryonic development, caused by genetic or environmental factors (Balazuc, 1948). In the last 50 years teratology in beetles has been discussed by various authors, including Balazuc (1948), Gamarra and Outerelo (1986), Osuna (1992), Ortuño and Hernández (1993), Navarrete-Heredia et al. (2002), and Savini and Furth (2004), who analyzed species of Carabidae, Cerambycidae, Chrysomelidae, Meloidae, Staphylinidae, Scarabaeidae and Tenebrionidae. For Staphylinidae, anomalies have been described in species belonging to 8 subfamilies, but especially the Staphylininae (Table 1).

The goal of this work is to compile the teratological cases previously described in the Staphylinidae and present 10 new examples of anomalies in the mouthparts, antennae, pronotum and legs. Some of these anomalies

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Table 1. Teratological cases previously recorded in Staphylinidae. Bibliographical references with 1 asterisk (*) were taken from Frank (1981), and those with 2 asterisks (**) from Gamarra and Outerelo (1986). Taxa are arranged alphabetically and were corroborated with catalogue of Herman (2001) and Löbl and Smetana (2004).

Subfamily	*Species*	*Type of anomaly*	*Description of the anomaly*	*Reference*
Aleocharinae	*Atheta divisa* (Märkel, 1845)	Diverse anomalies	Asymmetrical pronotum	Strand (1959)*
	A. parvicornis Mulsant & Rey, 1873	Symphysocery	Left antenna with initial fusion in antennomeres 9 and 10	Gamarra and Outerelo (1986)
	A. sordidula (Erichson, 1837)	Symphysocery	Left antenna with deformation, antennomeres 3 and 4 asymmetric, antennomere 5 with apical portion longer and fused with the antennomere 7, antennomere 6 reduced to a plate joining antennomeres 5 and 7, antennomeres 7-11 with symphysocery and graves in the union between antennomeres 8-9 and 10-11	Gamarra and Outerelo (1986)
	Autalia puncticollis Sharp, 1864	Diverse anomalies	Head excavated in left side; left half of pronotum asymmetric respect with to the right half	Gamarra and Outerelo (1986)
	Ocalea skalitzkyi Bernhauer, 1902	Symphysocery	Left antenna with near total fusion	Gamarra and Outerelo (1986)
	Oxypoda annularis Mannerheim, 1830	Symphysocery	Right antenna with antennomeres 8-9 and 10-11 fused	Gamarra and Outerelo (1986)
	O. praecox Erichson, 1839 Cited as *O. inexpectata* (Fagel, 1965), junior synonymy	Symphysocery	Left antenna with antennomere 7 prolonged laterally until the apical portion of the next antennomere in a plate where antennomere 8 is included; the same deformation is present in antennomere 8, and antennomeres 9 and 10 are fused	Gamarra and Outerelo (1986)
	O. platyptera Fairmaire, 1859	Atrophy or micromely	Antenna shorter since antennomere 7	Gamarra and Outerelo (1986)
Osoriinae	*Lusitanopsis salamantica* Outerelo, 1977 Cited as *L. salamanticus*	Hemiatrophy	Abdominal segments 4 and 5 almost totally fused	Outerelo (1977)**
Oxyporinae	*Oxyporus lawrencei* Campbell, 1974	Symphysocery	Left antenna with antennomeres 5-6 fused	Navarrete-Heredia et al. (2002)
	O. mexicanus Fauvel, 1865	Schistomely and symphysocery	Left antenna with bilateral ramification and fusion	Navarrete-Heredia et al. (2002)

Table 1. Continues

Subfamily	*Species*	*Type of anomaly*	*Description of the anomaly*	*Reference*
Oxytelinae	*Anotylus sculpturatus* (Gravenhorst, 1806) Cited as *Oxytelus*	Hemiatrophy	Malformations in abdominal segments 5 and 6	Gamarra and Outerelo (1986)
Paederinae	*Paederidus ruficollis* (Fabricius, 1777)	Schistomely	Bifurcation of last femora, which have normal tibia and tarsi, and a rudimentary appendage	Balazuc (1969)*
	P. rubrothoracicus (Goeze, 1777) Cited as *P. sanguinicollis* (Stephens, 1833), junior synonymy	Diverse anomalies	Symmetrical deformation of pronotum	Fauvel (1901)*
	Rugilus erichsoni (Fauvel, 1867)	Helicomery	Hemisclerite of 1 side of a body segment fused with the hemisclerite of the other side of the body segment following	Balazuc (1969)*
	Scopaeus mitratus Binaghi, 1935	Diverse anomalies	Aedeagus is included in a chitinous bag, with its complete structures, but inverted with respect to its normal position	Gamarra and Outerelo (1986)
Staphylininae	*Bisnius fimetarius* (Gravenhorst, 1802) Cited as *Philonthus*	Schistomely	Reduplication of the tibia and tarsi in posterior femur	Cockayne (1937)*
	Glenus setosus Sharp, 1887	Symphysocery	Right antenna with antennomeres 9-10 partially fused	Navarrete-Heredia et al. (2002)
	Glenus sp.	Schistomely	Left antenna with ramification since antennomere 9 to apical antennomere	Navarrete-Heredia et al. (2002)
	Glenus sp.	Diverse anomalies	Left elytrum deformed	Navarrete-Heredia et al. (2002)
	Ocypus nitens (Schrank, 1781) Cited as *O. similis* (Fabricius, 1793), junior synonymy	Diverse anomalies	Mandibles with deformation	Balazuc (1948)
	O. nitens (Schrank, 1781) Cited as *O. similis* (Fabricius, 1793), junior synonymy	Schistomely	Bifurcate antenna	Stannius (1835)*
	O. olens (O. Müller, 1764)	Atrophy	Right antenna reduced to 2 small antennomeres	Ortuño and Hernández (1993)
	O. olens (O. Müller, 1764)	Diverse anomalies	Abnormal ventral nervous system	Green (1952)*
	Philonthus brevithorax Bernhauer, 1934	Diverse anomalies	Posterior margin of head deformed	Schilhammer and Smetana (2000)

Table 1. Continues

Subfamily	*Species*	*Type of anomaly*	*Description of the anomaly*	*Reference*
Staphylininae	*P. concinnus* (Gravenhorst, 1802)	Synphisopody	Fusion of segments in legs	Korge (1961, in Ortuño and Hernández 1993)
	P. decorus (Gravenhorst, 1802)	Malformations of the aedeagus	Aedeagus with malformation	Coiffait (1965)*, Frank (1981)*
	P. intermedius (Lacordaire, 1835)	Hemiatrophy	Disappearance of fifth abdominal sternite	Gamarra and Outerelo (1986)
	P. quisquiliarius (Gyllenhal, 1810)	Diverse anomalies	Symmetrical deformation of pronotum	Wollaston (1867)*
	Rabigus pullus (Nordmann, 1837) Cited as *Philonthus*	Atrophy	Reduction of antennae, palpi, tarsi and elytra	Balazuc (1969)*
	Tasgius ater (Gravenhorst, 1802) Cited as *Ocypus*	Malformations of the aedeagus	Aedeagus with malformation	Kevan (1961)*
Steninae	*Stenus impressus* Germar, 1824	Ectromely	Middle tarsi united directly to the femur	Allen (1958)*
	S. juno (Paykull, 1789)	Malformations of the aedeagus	Atrophy of aedeagus	Renkonen (1939)*
Tachyporinae	*Tachinus axillaris* Erichson, 1839	Schistomely	Left femur of first leg partially bifurcate at the apex, inferior branch of the bifurcation has a normal tibia and tarsi	Frank (1981)

have been reported frequently in previous studies, but others are rarely presented.

Material and methods

Specimens studied were obtained on loan from the following collections: Museo de Zoología, Facultad de Ciencias, UNAM, México, D. F., México (MZFC, J. J. Morrone); American Museum of Natural History, New York, USA (AMNH, L. Herman); Field Museum of Natural History, Chicago, USA (FMNH, A. Newton); The Natural History Museum, London, United Kingdom (BMNH, M. Brendell); Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium (IRSNB, G. Yvonnick); and National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA (NMNH, D. Furth).

The anomalies studied herein, except these in *Belonuchus apiciventris* (Sharp, 1885), were detected when the systematic revision of the genus *Plochionocerus* Dejean, 1833 was undertaken, so we are using the classification that resulted from that study and treat *Agrodes* Nordmann, 1837 and *Plochionocerus* Dejean, 1833 as distinct taxa (Asiain et al., 2007).

The classification used to describe the deformations is based on Balazuc's (1948) proposal and the terms are defined herein.

Results

Compilation of the teratological cases in Staphylinidae based on all the available literature (Balazuc, 1948; Frank, 1981; Gamarra and Outerelo, 1986; Ortuño and Hernández, 1993; Schillhammer and Smetana, 2000; Navarrete-Heredia et al., 2002), teratological cases described in specimens of Staphylinidae were compiled and summarized in Table 1. They have been described for the following subfamilies: Aleocharinae (8), Osoriinae (1), Oxyporinae (2), Oxytelinae (1), Paederinae (4), Staphylininae (15 cases), Steninae (2) and Tachyporinae (1).

Description of the new teratological cases. 1. Anomalies in antennae.

1.1. Schistomelies. This type of monstrosity has been frequently studied and was the first type of teratology detected in Coleoptera (Balazuc, 1948). It consists of the division of an appendage into 2 (binary schistomely), 3 (tertiary schistomely) or more branches (complex schistomely). If the specimen has more than 1 divided appendage, it is a multiple schistomely; if the appendage presents simultaneously an anomaly from a distinct teratological type, the schistomely is combined; if the different anomalies are presented in different parts of the body, the schistomely is associated (Balazuc, 1948).

Belonuchus apiciventris (Sharp, 1885; Staphylininae: Staphylinini).

Anomaly: Binary schistomely, slightly heterodynamic in right antenna. Description: The first 7 antennomeres are normal, antennomere 8 is wider than normal and from it originates a bifurcate branch that includes antennomeres 9 and 10 which are fused medially. Antennomere 11 is inserted on both branches and is shorter and malformed on the left branch (Fig. 1).

Specimen studied. "México: Morelos, Tlayacapan, San José de los Laureles. NTP-80. Loc. 1. Bosque de pino-Encino. Agosto 1995. K. Villavicencio y J. Márquez. cols." (MZFC, 1♂).

1.2. Symphysomelies. This usually consists of the fusion of antennomeres (symphysoceries) or, less frequently, the fusion of segments of legs (symphysopodies; Balazuc, 1948). Balazuc (1948) indicates that partial or total fusions of pairs of antennomeres from 6 to 11 are common, and less so for 4 and 5 and rare for 3 and 4. Apparently symphysoceries occur especially in Cerambycidae (Balazuc, 1948; Ortuño and Hernández, 1993), but also have been detected in Carabidae, Tenebrionidae and Staphylinidae (Ortuño and Hernández, 1993). The cases described here are symphysoceries.

Agrodes elegans Nordmann,1837 (Staphylininae: Xantholinini)

Anomaly: Unilateral symphysocery type 8-9-10. Description: Antennomere 8 of the right antenna is fused with antennomere 9, which is fused with antennomere 10 on their internal sides. The internal side of antennomere 8 is longer than the external side (Fig. 2).

Specimen studied. "Perú: Cuzco Dept., Consuelo, Manu re. km 165, 7-X-1982,/ FMNH #82-350, ex litter under crown of felled tree, L. E. Watrous and G. Mazurek" (FMNH, 1♂).

Agrodes elegans Nordmann, 1837

Anomaly: Unilateral symphysocery type 7-8 and 9-10-11. Description: Antennomeres 7-11 of the right antenna are fused. Antennomere 7 is fused with antennomere 8 on their external side, antennomeres 8 and 9 are partially fused,

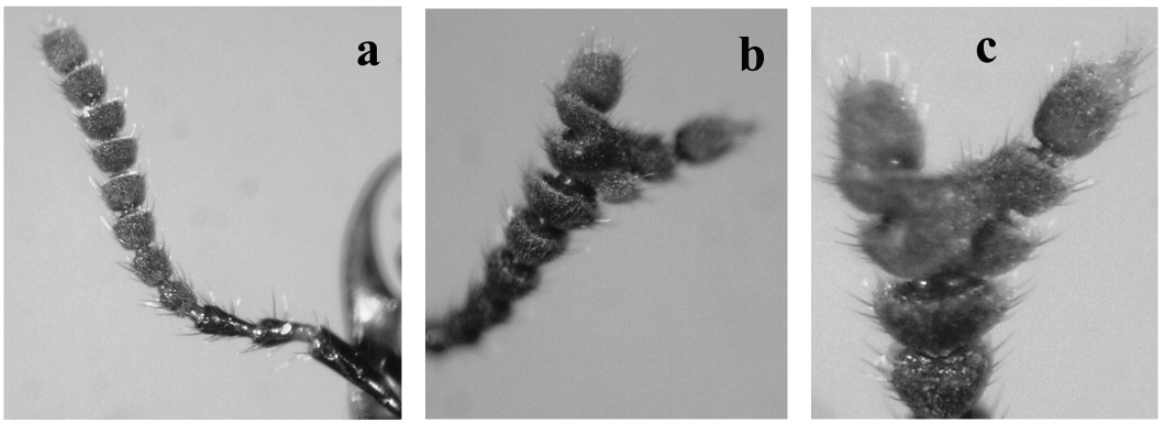

Figure 1. *Belonuchus apiciventris*: a, normal left antenna; b, right antenna with binary schistomely; c, close-up of antennomeres with malformation.

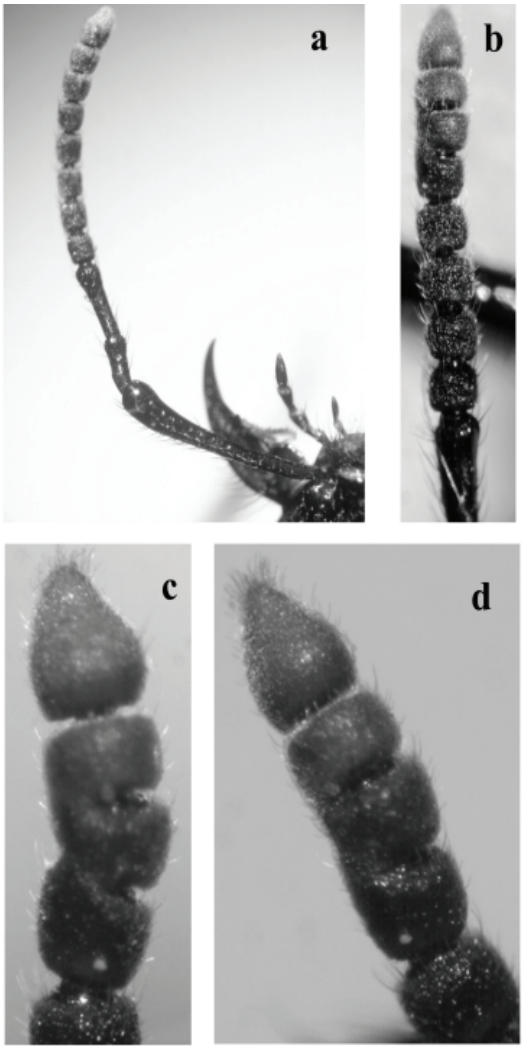

Figure 2. *Agrodes elegans*: a, normal left antenna; b, right antenna with symphysocery type 8-9-10; c, close-up of antennomeres with malformation in dorsal view; d, close-up of antennomeres with malformation in dorso-lateral view.

and antennomeres 9-11 are totally fused. Antennomeres 8-11 are fused dorsally and ventrally on their right half (Fig. 3).
Specimen studied. "Perú: Cuzco Dept., Consuelo, Manu re. Km 165, 7-X-1982,/ FMNH #82-350, ex litter under crown of felled tree, L. E. Watrous and G. Mazurek" (FMNH, 1♂).

Plochionocerus humeralis (Sharp, 1885; Staphylininae: Xantholinini)
Anomaly: Unilateral symphysocery type 9-10. Description: Antennomeres 9 and 10 of the left antenna are fused on their external side and the external side of antennomere 9 is slightly shorter than the internal side (Fig. 4).
Specimen studied. "Tena Ecuador/ F. X. Williams Collector/ Tena Ecuador March 27, 1923/ Field Mus. Nat. Hist. 1966 A. Bierig Colln. Acc. Z-13812" (FMNH, 1♂).

Plochionocerus fulgens (Fabricius, 1876).
Anomaly: Unilateral symphysocery type 10-11. Description: Antennomeres 10 and 11 of the left antenna are fused at their point of articulation (Fig. 5).
Specimen studied. "Venezuela: T. F. A. Camp V. 0°49'N, 66°0'W Cerro d. 1. Neblina 1250m 23-24 March 1984, O.S. Flint, Jr./ United States National Museum" (USNMNH, 1♀).

Plochionocerus fulgens (Fabricius, 1876)
Anomaly: Unilateral symphysocery type 8-9. Description: Antennomeres 8 and 9 of the left antenna are partially fused latero-dorsally on their external side (Fig. 6).
Specimen studied. "Brazil: Para: Jacareacanga. Feb. 1970. F. R. Barbosa" (AMNH, 1♂).

Plochionocerus splendens (Blanchard, 1842).
Anomaly: Unilateral symphysocery type 4-5-6, 7-8 and 9-10-11. The right antenna exhibits the near complete

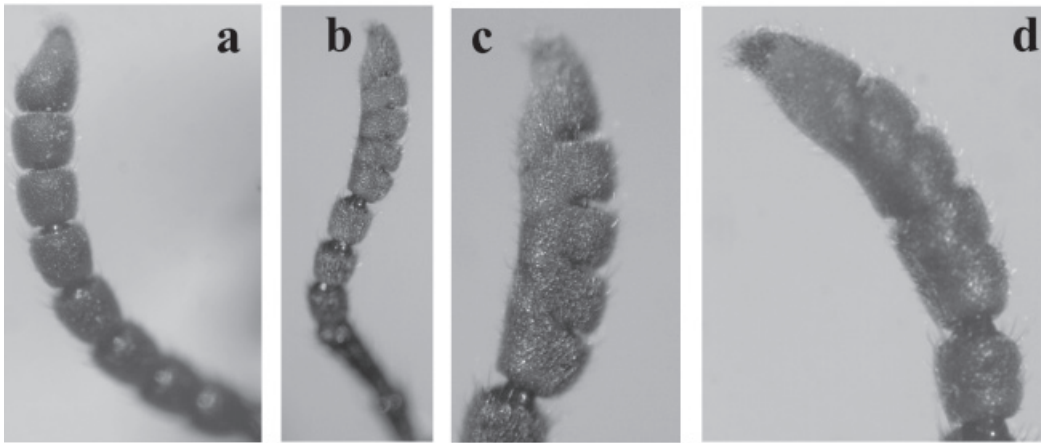

Figure 3. *Agrodes elegans*: a, normal left antenna; b, right antenna with symphysocery type 7-11; c, close-up of antennomeres with malformation in dorsal view; d, close-up of antennomeres with malformation in lateral-ventral view.

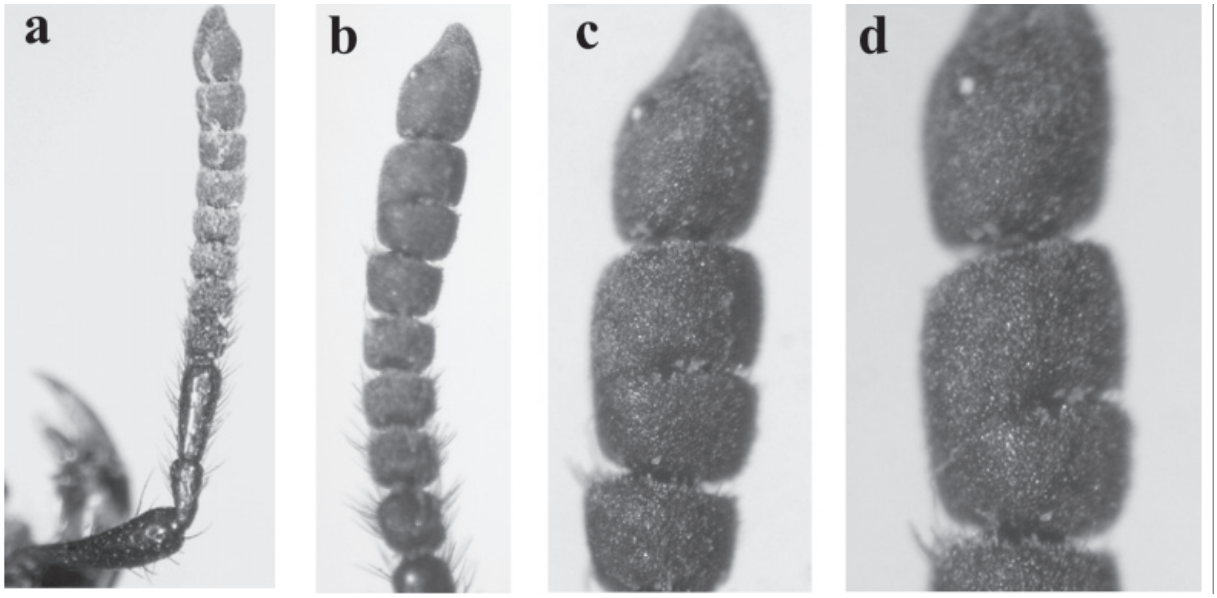

Figure 4. *Plochionocerus humeralis*: a, normal right antenna; b, left antenna with symphisocery type 9-10; c-d, close-up of teratological antennomeres in dorsal view.

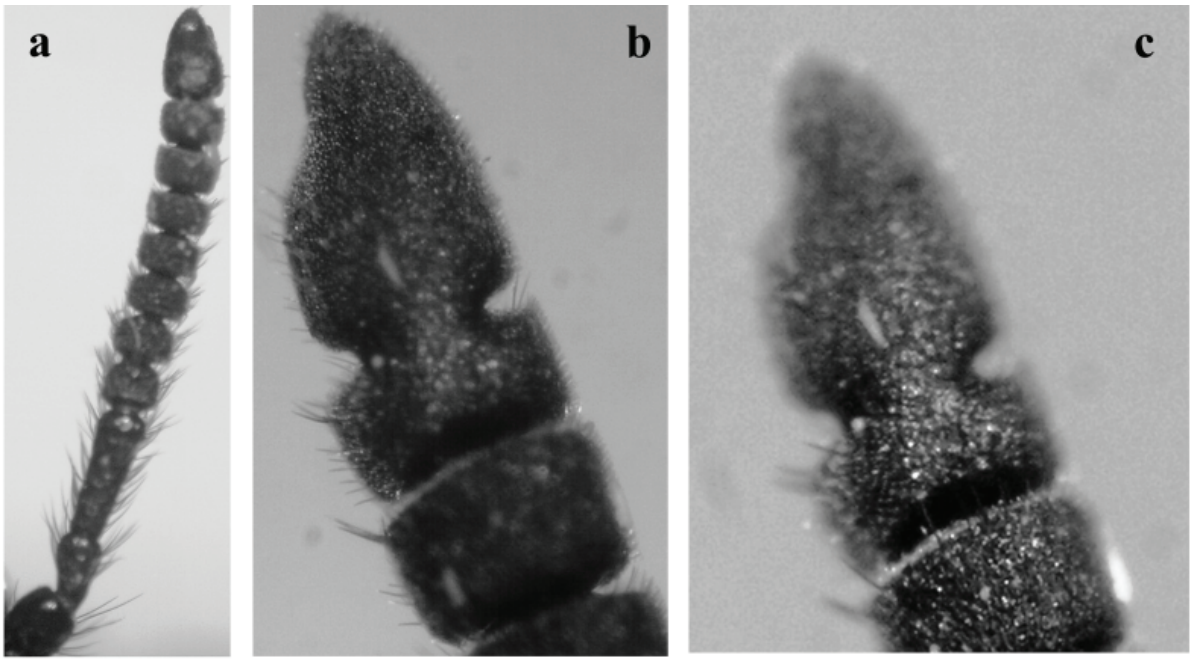

Figure 5. *Plochionocerus fulgens*: a, normal right antenna; b, left antenna with symphysocery type 10-11; c, close-up of antennomeres with malformation.

fusion of antennomeres 4-6, 7-8, and 9-11. The length of antennomeres 4-11 are reduced, resulting in a shorter antenna compared with the left one (Fig. 7). In the first fusion (4-5-6), antennomere 4 is notably reduced and scarcely visible in dorsal view (Fig. 7c), ventrally it is completely fused with antennomere 5. Antennomeres 5 and 6 are longer than antennomere 4, and are nearly completely fused dorsally and ventrally. The second malformation affects antennomeres 7 and 8 of the right antenna, which are near completely fused and approximately are of the

same size (Fig. 7). In the third fusion (9-11), antennomeres 9-10 are near completely fused, and antennomeres 10-11 are partially fused internally (Fig. 7b,c).
Specimen studied. "Yungas Bolivia/ *splendens* Blanch. Type/ R.I.SC.N.B. 17.479 Coll. et det. A. Fauvel" (IRSNB).

2. Anomaly in mouthparts
2.1. Diverse anomalies
Plochionocerus fulgens (Fabricius, 1876)
Anomaly: Asymmetrical anomaly. Description: The left mandible is longer than the right and the external margin is constricted (Fig. 8).
Specimen studied. "Bogota. 89-82." (BMNH, ♂).

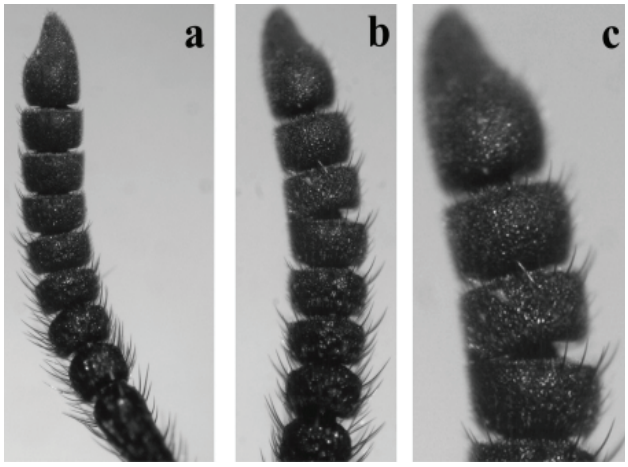

Figure 6. *Plochionocerus fulgens*: a, normal right antenna; b, left antenna with symphysocery type 8-9; c, close-up of antennomeres with malformation.

3. Anomalies in pronotum
3.1. Diverse anomalies
3.1.1. Symmetrical or asymmetrical marginal deformations of the pronotum. Include any form with symmetrical or asymmetrical hemiatrophy, protuberances or tumors (Balazuc, 1948).
Plochionocerus humeralis (Sharp, 1885)
Anomaly: Asymmetrical anomaly. Description: The right lateral margin of the pronotum has an acute protuberance anteriorly (Fig. 9).
Specimen studied. "Costa Rica: Puntarenas, Las Alturas Field Station, 20 km N San Vito de Hava. 1-5/VII/91. DeVries 1400m. Malaise trap" (AMNH, 1♀).

4.- Anomalies in legs
4.1. Combined schistomely: Different forms of heterodynamic and atypical schistomely could be considered to be the combination of schistomely and atrophy or the combination of schistomely-symphysocery
Plochionocerus humeralis (Sharp, 1885)
Anomaly: Atrophy of femur and tibia, and heterodynamic schistomely of tarsi. Description: The anterior third of the right mesofemur is constricted and forms an uncoded structure (Fig. 10c). The mesotibia is strongly expanded apically (Fig. 10e) and near the apical margin an apparently primordial tarsomere is found (Fig. 10c,f).
Specimen studied. "Middle Rio Ucayali, Peru XII.14.23 FB154/ F. Bassler Collection Acc. 33591" (AMNH, 1♂).

Discussion

The anomalies most frequently reported in Staphylinidae are symphysomelies (fusion of antennal or leg segments), particularly in antennae (symphysoceries), and diverse malformations, mainly in the pronotum, but

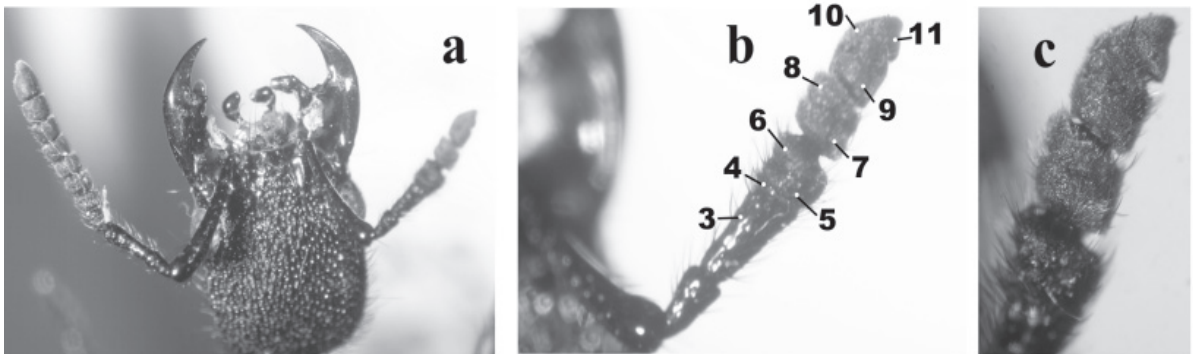

Figure 7. *Plochionocerus splendens*: a, dorsal view of head showing the normal left antenna and right antenna with malformation; b, right antenna with symphysocery type 4-11; c, close-up of antennomeres with malformation.

also in mandibles, head, thorax, elytra, aedeagus and central nervous system; schistomelies (bifurcation or trifurcation of appendages) in antennae and femora are reported less frequently. Ectromelies (reduction or total or partial loss of appendages in antennae, palpi, legs or tarsi), atrophies in antennae and elytra, hemiatrophies (lack of a hemisclerite), helicomeries (anomalies in segments) and malformations in the aedeagus are present in fewer than 4 cases each (Table 1).

Schistomelies in antennae have been frequently reported in the Coleoptera, especially in the Cerambycidae and Carabidae (Balazuc, 1948; Osuna, 1992; Ortuño and Hernández, 1993). Some cases have been also reported in Staphylinidae (Table 1). Binary schistomely has been documented in *Ocypus nitens* (Schrank, 1781), *Oxyporus mexicanus* Fauvel, 1865, and *Glenus* sp. (Table 1; Frank, 1981; Navarrete-Heredia et al., 2002).

Symphysocery of 2 or 3 antennomeres was described for several specimens of *Rhizotrogus villiersi* Baraud, 1970 (Scarabaeidae; Baraud, 1977, in Ortuño and Hernández, 1993). Ortuño and Hernández (1993) described an unilateral symphysocery type 4-5-6 in the cerambycid *Arhopalus rusticus* (Linnaeus, 1758), and another case in *Philorhizus vectensis* Rye, 1873 (Carabidae), with the fusion of the antennomeres 8-9-10-11. For Staphylinidae, Hervé (1971, in Ortuño and Hernández, 1993) described the fusion of the antennomeres 3-4-5 in *Gynotyphlus perpusillus* (Dodero, 1900). Cases of symphysocery involving more that 2 consecutive antennomeres have been reported for staphylinids *Atheta* (*Datomicra*) *sordidula* (Erichson, 1837) and *Oxypoda praecox* Erichson, 1839 (Gamarra and Outerelo, 1986). Navarrete-Heredia et al. (2002) recorded *Oxyporus lawrencei* Campbell, 1974 with the fusion of antennomeres 5-6 of the left antenna, and *Glenus setosus* Sharp, 1887 with the partial fusion of antennomeres 9-10 of the right antenna (Table 1). The previous records together with the cases described herein allow expansion of the concept of symphysocery established by Balazuc (1948), who cited only the total or partial fusion of pairs of antennomeres, to include the fusion of 3 or more antennomeres.

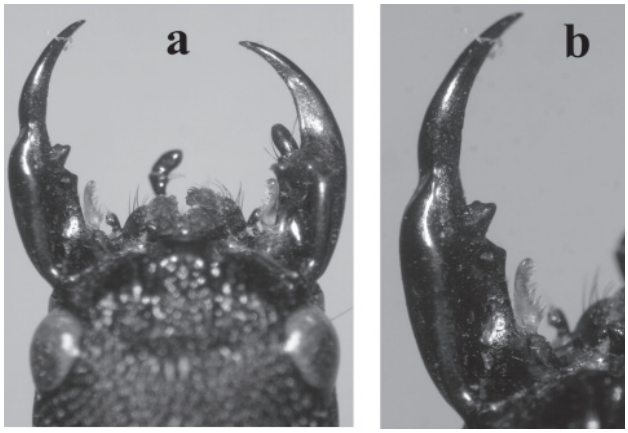

Figure 8. *Plochionocerus fulgens*: a, dorsal view of head showing the mandibles; b, left mandible showing asymmetrical anomaly.

The cases of unilateral symphysocery reported in previous studies are the following: a) fusion of 2 antennomeres, b) fusion in pairs of several antennomeres, c) fusion of 3 antennomeres or, d) fusion of 4 antennomeres. We add herein 2 new types of combined fusion: combined fusion of 2 and 3 antennomeres (*Agrodes elegans*) and combined fusion of 3, 2 and 3 antennomeres (*Plochionocerus splendens*). Although fusion of antennomeres 4-11 is found, apparently none has been reported for 1-3.

Symphysocery apparently occurs more frequently than other teratologies. Savini and Furth (2004) highlighted the fact that malformations in antennae are easily recognized, but in other structures, such as tarsi, the reduction or absence of a tarsomere may cause confusion at the family level; therefore it is necessary to continue describing teratological cases, not only in staphylinids, but also in other coleopterans.

Several cases of anomalies in mouthparts has been

Figure 9. Pronotum of *Plochionocerus humeralis* showing the marginal, asymmetrical deformation: a, dorsal view; b, lateral view; c, close-up of the protuberance on the anterior third of the pronotum.

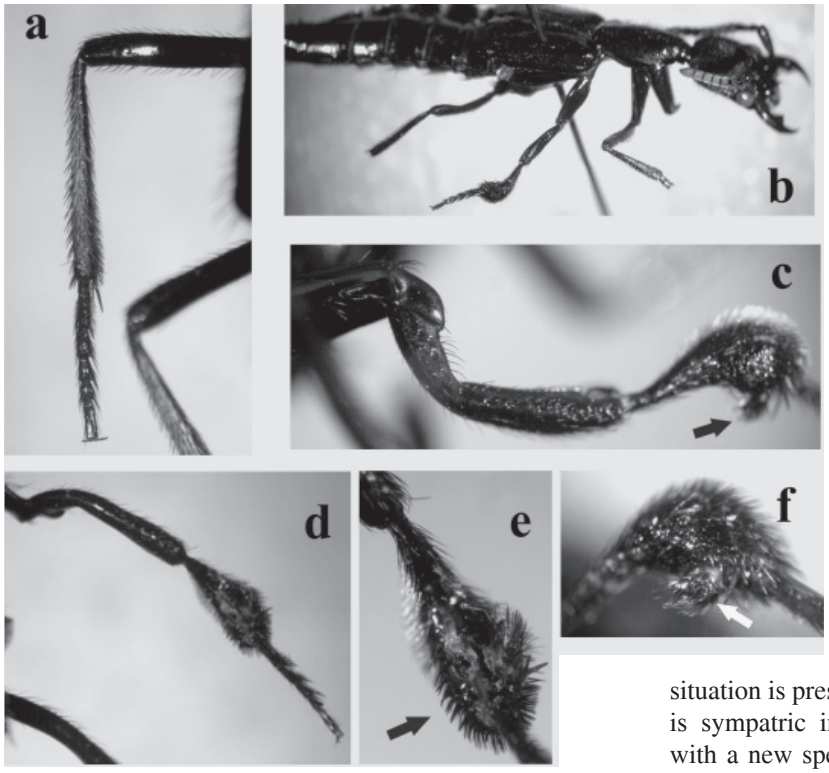

Figure 10. *Plochionocerus humeralis*: a, normal left midleg; b, dorso-lateral view of midleg with combined schistomely; c, close-up of the right midle femur with atrophy; d, lateral view of right midleg showing the atrophy in midle femur and tibia; e, close-up of the right midle tibia with atrophy; f, close-up of the midle tibia showing rudimentary, duplicated tarsomeres.

described in the Coleoptera, but most cases of malformation are reported for the maxillary and labial palpi, and less frequently for the mandibles. Malformations have been reported in the mandibles of *Ocypus nitens* (Schrank, 1781) (Table 1, Balazuc, 1948).

The endomychid *Corynomalus cruciatus* (de Mocquerys, 1880) has a protuberance on the right posterior corner of the pronotum (Balazuc, 1948). In the Staphylinidae an asymmetrical pronotum was recorded from a specimen of *Atheta divisa* (Märkel, 1845). Specimens of *Philonthus quisquiliarius* (Gyllenhal, 1810) and *Paederus rubrothoracicus* (Goeze, 1777) were reported with symmetrical pronotal deformations (Table 1).

The incorporation of the last teratological case (4.1) into Balazuc's (1948) classification was difficult because he presents examples combining schistomely with symphysoceries (antennae) or symphysopodies (legs), but no examples are cited with the combination of schistomely with atrophy, nor were any reported in the literature consulted. This type of malformation is probably infrequent.

It would be relevant to study of the causes of such anomalies, but this is beyond our capabilities. Balazuc (1948) considered several possible causes of the malformations, including mutations of the germ cells or somatic cells, egg development, and mechanic, physical and chemical factors (which can intervene in several stages of the development of the insect).

An important observation resulting from systematic revision of the genera *Agrodes* and *Plochionocerus*, is the fact that several species have a sympatric distribution (based on the label information), with result that these species are taxonomically difficult to identify due to their high morphological similarity and the scant differences in their aedeagi. A similar situation is presented with *Belonuchus apiciventris*, which is sympatric in some localities from Morelos, Mexico with a new species of *Belonuchus* and also with at least 3 other congeneric species: *B. basiventris* (Sharp, 1885), *B. oxyporinus* (Sharp, 1885) and *B. rufipennis* (Fabricius, 1801). Females of the new species of *Belonuchus* cannot be distinguished from the females of the sympatric *B. apiciventris*, limiting the description of the new species, although the males present several differences. Also, *B. apiciventris* has a color pattern and size similar to the 3 species previously cited, but can be distinguished, even males and females (Márquez, 2003).

The foregoing information allows us to question whether there is a relationship between the presence and frequency of the detected malformations with the possibility that the studied species of *Belonuchus*, *Agrodes* and *Plochionocerus* (probably closely related) reflect some attempts at copulation, or that probably have not yet completed the process of speciation. Only with a planned study to test these possibilities will be possible to resolve our doubts.

We consider it important to describe the malformations detected in any specimen of a species, because there are several cases where teratological specimens have been described as new taxa. Coiffait (1965) described a teratological specimen of *Philonthus decorus* (Gravenhorst, 1802) as a new genus and new species, and Wollaston (1867) described a teratological specimen of *Philonthus quisquiliarius* as a new species. Schillhammer and Smetana (2000) described a teratological specimen of *Philonthus brevithorax* Bernhauer, 1934, but initially thought it to be

a new genus and new species.

Probably there are additional teratological cases in Staphylinidae among entomological collections, but they may have not been detected or there is not enough interest in this theme. However, the phenomena could be most important to entomologists because the anomalies could cause problems of taxonomic identity at various levels (species, genus or even family).

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Literature cited

Asiain, J., J. Márquez and J. J. Morrone. 2007. Phylogenetic systematics of the genera *Plochionocerus* Dejean and *Agrodes* Nordmann (Coleoptera: Staphylinidae: Xantholinini). Zootaxa 1584:1-53.

Balazuc, J. 1948. La tératologie des coléoptères et expériences de transplantation sur *Tenebrio molitor* L. Mémoires du Muséum National d'Histoire Naturelle 25:l-293.

Coiffait, H. 1965. *Sectophilonthus* - Novyi dlia palearktiki zamechatelsny: rod triby Philonthini (Coleoptera, Staphylinidae). Zoologicheskii Zhurnal 44:615-617.

Frank, J. H. 1981. A review of teratology in Staphylinidae, with description of a teratological specimen of *Tachinus axillaris* Erichson (Coleoptera, Staphylinidae, Tachyporinae) from Florida. Florida Entomologist 64:337-340.

Gamarra, P. and R. Outerelo. 1986. Diversos casos teratológicos en estafilinoideos (Coleoptera: Staphylinoidea). Actas VIII Jornadas AEE. Sevilla. p. 539-547.

Herman, L. 2001. Catalog of the Staphylinidae (Insecta: Coleoptera). 1758 to the end of the second millennium. Parts I-VII. Bulletin of the American Museum of Natural History 265:1-4218.

Löbl, I. and A. Smetana. 2004. Catalogue of Palaearctic Coleoptera. Volume 2. Hydrophiloidea - Histeroidea - Staphylinoidea. Apollo Books, Stenstrup. 942 pp.

Márquez, J. 2003. Ecological patterns on necrophilous Staphylinidae (Insecta: Coleoptera) from Tlayacapan, Morelos, México. Acta Zoológica Mexicana (nueva serie) 89:69-83.

Navarrete-Heredia, J. L., A. F. Newton, M. Thayer, J. Ashe and D. Chandler. 2002. Guía ilustrada para los géneros de Staphylinidae (Coleoptera) de México. Illustrated guide to the genera of Staphylinidae (Coleoptera) of Mexico. Universidad de Guadalajara y CONABIO, México, D. F. 401 pp.

Ortuño, V. M. and J. M. Hernández. 1993. Diversos casos teratológicos en Coleoptera. Boletín de la Real Sociedad Española de Historia Natural (Sección Biología) 89:163-179.

Osuna, E. 1992. Fenómeno teratológico en *Psalidognathus* sp. (Coleoptera: Cerambycidae). Boletín Entomológico Venezolano, N. S. 7:145-156.

Savini, V. and D. Furth. 2004. Teratología en Coleoptera: Un caso en *Gioia bicolor* (Blake 1969) (Chrysomelidae, Alticinae) de Jamaica. Entomotropica 19:165-167.

Schillhammer, H. and A. Smetana. 2000. A remarkable teratology of *Philonthus brevithorax* (Coleoptera: Staphylinidae). Entomological Problems 31:179-180.

Torre-Bueno de la J. R. 1989. The Torre-Bueno glossary of entomology; compiled by Stephen W. Nichols; including Supplement A by Georges S. Tulloch. New York. The New York Entomological Society, xxii + 840 pp.

Wollaston, T. V. 1867. Coleoptera Hesperidum, being an enumeration of the coleopterous insects of the Cape Verde archipelago (with appendix containing addenda etc. to the Coleoptera Atlantidum). Van Voorst, London, xxxix + 285 pp + 1 map.