

Description of a new species of *Saphonecrus* Dalla Torre & Kieffer from China (Hymenoptera: Cynipidae: Synergini)

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A new inquiline species of *Saphonecrus* Dalla Torre & Kieffer, *S. reticulatus* sp. n., is described with its host gall. This species emerged from stem galls on *Quercus aliena* var. *acutiserrata* (Fagaceae). Diagnosis, distribution, and biology of the new species are included and the most important morphological characters are illustrated.

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1. Introduction

Saphonecrus is an inquiline genus associated with oak gallwasps (Cynipini). Inquilines have retained the ability to modify the gall tissue directly surrounding them into the characteristic nutritive tissue also found in the larval chambers of the gall inducer, but they have lost the ability to initiate the gall. Nevertheless, a few inquiline species are mentioned as gallinducers (Abe *et al.* 2011, Liu *et al.* 2012, Bernardo *et al.*, in press).

Saphonecrus is represented by 23 species distributed in the northern hemisphere but only six of them are mentioned from China: *S. sinicus* Belizin, 1968; *S. chaodongzhui* Melika, Ács & Bechtold, 2004; *S. flavitibialis* Wang & Chen, 2010 (in Wang *et al.* 2010); *S. tianmushanus* Wang & Chen, 2010 (in Wang *et al.* 2010); *S. naiquanlini* Melika, Ács & Bechtold, 2004 and *S. hupingshanensis* Liu, Yang & Zhu, 2012. Al-

though the systematic status of the genus has long been considered to be in need of revision (Pujade-Villar & Nieves-Aldrey 1990, Pujade-Villar *et al.* 2003, Melika 2006, Penzes *et al.* 2009, 2012), the changes are not formally published for this. We report a new species of *Saphonecrus* according to the current definition of the genus.

2. Material and methods

The specimens from China used in this study are from the Hymenoptera Collection, Zhejiang Agricultural and Forest University, Lin'an, China (ZJUH).

We followed the current terminology of cynipid gallwasp morphology (Liljeblad & Ronquist 1998, Melika 2006). Abbreviations for the forewing venation followed Ronquist and Nordlander (1989), terminology of cuticular sur-

face followed that of Harris (1979). Measurements and abbreviations used here include:

- F1–F12, first and subsequent flagellomeres
- POL, post-ocellar distance, the distance between the inner margins of the posterior ocelli
- OOL, ocellar–ocular distance, the distance from the outer edge of the posterior ocellus to the inner margin of the compound eye
- LOL, the distance between lateral and frontal ocelli

The width of the forewing radial cell was measured from the margin of the wing to the Rs vein.

Descriptions and measurements were made under a Leica MZ 12.5 stereomicroscope (Wetzlar, Germany). Photos for Fig. 1 were taken by a digital camera (Q-Imaging, Micropublisher 3.3 RTV) attached to a Leica MZ APO stereomicroscope (Wetzlar, Germany) using Synoptics Auto-Montage version 5.0 software. For Fig. 2, the field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM) was used for high-resolution imaging without gold-coating.

All type specimens are deposited in the Hymenoptera Collection of ZJUH and UB (University of Barcelona, coll. JP-V).

3. Description of *Saphonecrus reticulatus* sp. n. (Figs 1, 2)

Type specimens examined. Holotype: ♀, deposited in ZJUH: China, Zhejiang, Xitianmu Mountain 119°27 E, 30°19 N), 19.VI., Rui Guo leg. Paratypes: 5 ♀♀, with same data as the holotype (one deposited in UB).

Diagnosis. The species here described differs from all species of *Saphonecrus* by having a mesopleuron partially reticulated; all known species of *Saphonecrus* have a carinated mesopleuron (except *S. diversus*, smooth). The new species has pronotal carina, nevertheless differs from the *Saphonecrus* with pronotal carina (*S. haimi*, *S. irani*, *S. shirakashii*, *S. shirokashicola*, *S. undulatus*, *S. areolatus* and *S. serratus*) by having also the strong sculpture. The new species is defined by a combination of the following features: body color black; lateral frontal carina and lateral

pronotal carina present; antennae with 11 flagellomeres; tarsal claws with a basal tooth; mesopleuron carinated, partially reticulated; scutellar foveae with longitudinal carinae; notauli complete; medial line very long; and fused segments 2+3 of metasoma with a vertical line of 5–6 setae. This species is related morphologically to *S. hupingshanensis* having the frons strongly punctuated, but can be differentiated by *S. hupingshanensis* having head orange, antennae with 14 segments, mesopleuron without reticulated sculpture and suture of metasomal fused 2+3 present.

Description. Length. Female 2.0 mm, male unknown.

Colour. Body black. Antenna pale yellow medially, and darker pale brown basally and apically. Wing hyaline, with distinct brownish veins.

Head (Fig. 1a, b, e, 2a–c). Head delicately coriaceous, with dense white setae; 1.8 times as wide as median length in dorsal view, 1.4 times as wide as high in front view and slightly narrower than mesosoma. Gena rugose, not broadened behind eye, invisible in front view, narrower than cross diameter of eye, measuring behind eye. POL: LOL: OOL=2.5: 1.3: 1.5, OOL two times as long as diameter of lateral ocellus. Transfacial distance 1.2 times as long as height of eye; diameter of antennal torulus 1.5 times as long as distance between them, distance between torulus and eye margin 1.3 times as long as diameter of torulus. Inner margins of eyes curved. Face with a medial distinct carina from antennal torulus to clypeus. Lower face delicately coriaceous, with sparse white setae and dense delicate striae irradiating from clypeus, and reaching eye and ventral margin of toruli. Clypeus inconspicuous, with distinct small anterior tentorial pits; epistomal sulcus indistinct; clypeo-pleurostomal lines indistinct, ventral margin straight, without incision medially. Frons and vertex strongly coriaceous and strongly punctuate, with some longitudinal carina between punctures; lateral frontal carina distinct but weakly impressed, extending to lateral ocelli; occiput strongly coriaceous with some rugae.

Antenna (Fig. 1d). Antenna 13-segmented, slightly longer than head plus mesosoma; scape with dense setae; pedicel 1.6 times as long as wide; F1 1.3 times as long as F2 and 1.7 times as

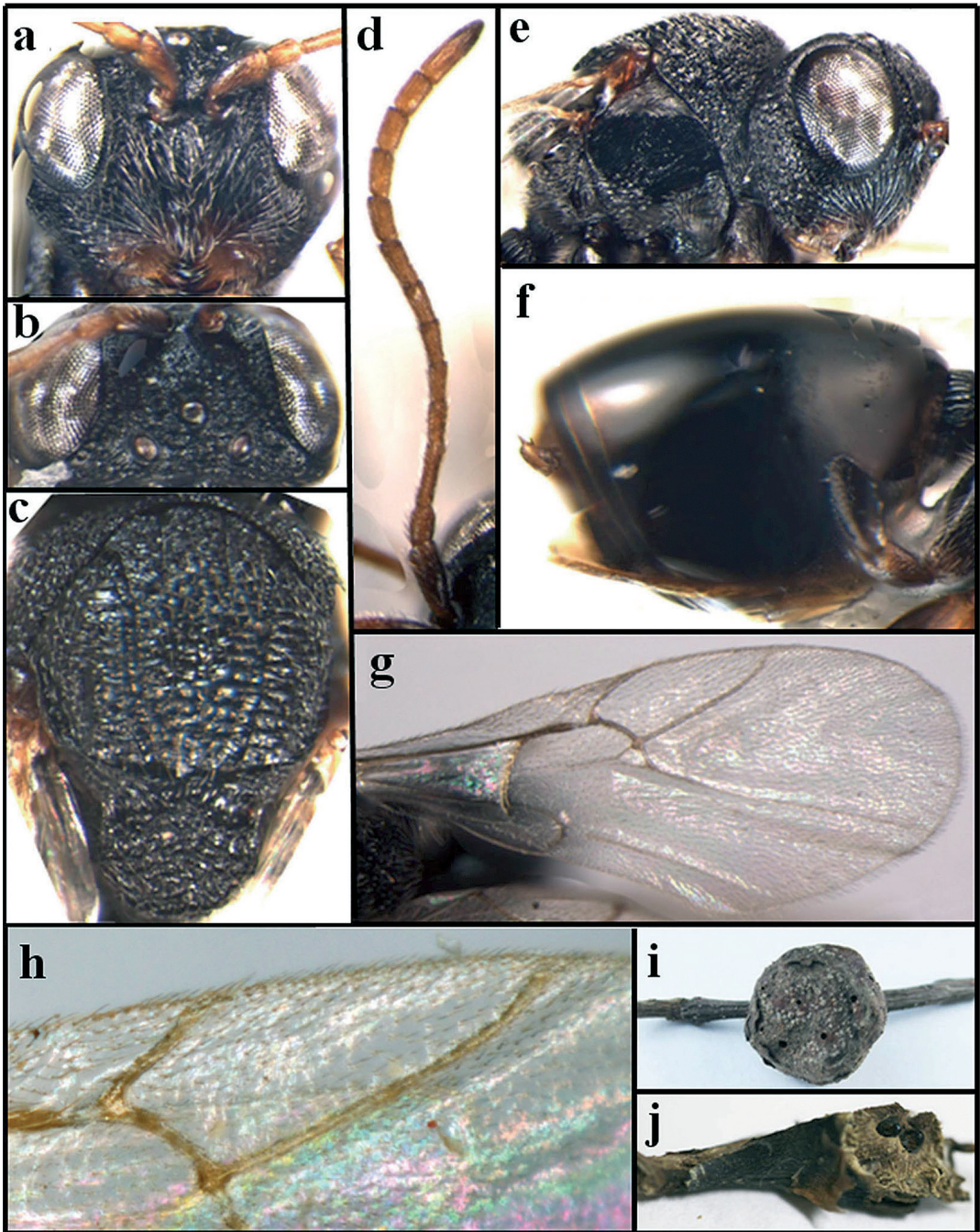


Fig. 1. *Saphonecrus reticulatus* sp. n. – a. Head, anterior view. – b. Head, dorsal view. – c. Mesosoma, dorsal view. – d. Antenna. – e. Mesosoma, lateral view. – f. Metasoma, lateral view. – g. Forewing. – h. Radial cell of fore wing. – i. Gall. – j. Gall, cut-off.

long as pedicel; F11 1.9 times as long as F10; relative lengths of antennal segments from scape to F11: 19: 8: 13: 10: 8: 8: 8: 11: 10: 10: 9: 9: 17.

Mesosoma (Fig. 1c, e, 2c–e). Mesosoma con-

vex, slightly longer than height in lateral view, with dense white setae. Pronotum carinated laterally with interspaces strongly coriaceous. Mesoscutum strongly coriaceous, slightly longer than

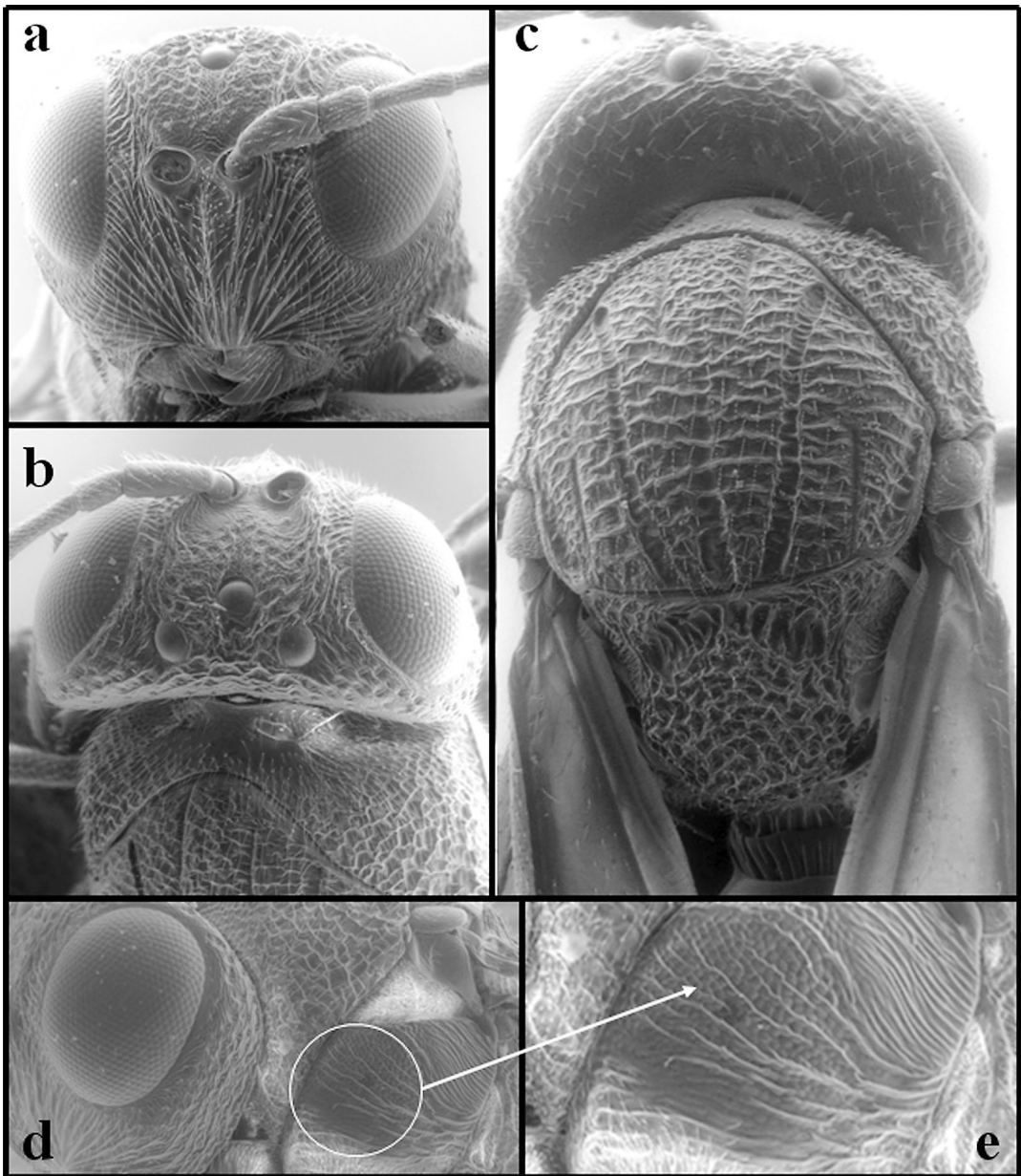


Fig. 2. *Saphonecrus reticulatus* sp. n. – a. Head, anterior view. – b. Head, dorsal view. – c. Head and mesosoma, dorsal view. – d. Mesopleuron. – e. A detail of mesopleuron.

wide, with distinct transverse carinae and few white setae. Notauli complete, well-impressed along entire length of mesoscutum, weakly converging posteriorly; median mesoscutal line extending to $2/3$ of mesoscutum length; parapsidal lines distinct and extending to $1/4$ of mesoscutum length; anterior parallel lines distinct and visible and extending to $1/3$ of mesoscutum length.

Mesoscutellum rugose, slightly longer than wide, with some transverse carinae. Scutellar foveae deeply impressed, confluent or separated by a weak carina, bottom alutaceous with longitudinal carina. Mesopleuron with distinctly interrupted delicate longitudinal striae, reticulate in the anterior part and between carina; speculum smooth and shiny, without setae; mesopleural triangle

densely setose. Metapleural sulcus reaching mesopleuron in 3/4 of its height. Lateral propodeal carina distinct, subparallel and slightly convergent posteriorly; median propodeal area alutaceous, with longitudinal rugae and dense setae.

Legs. Tarsal claws with large basal lobe and tooth.

Wing (Fig. 1g–h). Forewing longer than body, margin with long cilia; radial cell opened, 2.6 times as long as its maximum width; areolet distinct; vein Rs+M well-marked and extending to half of entire distance between areolet and basal vein.

Metasoma (Fig. 1f). Metasoma slightly longer than head plus mesosoma, and 1.35 times as long as its maximum height in lateral view. Fused metasomal tergites 2+3 with vertical line of white setae anterolaterally, and with micropunctures apically; subsequent tergites with micropunctures and with setae; prominent part of ventral spine of hypopygium very short; hypopygium partially micropunctate.

Distribution. China (Zhejiang).

Biology. The species was reared from twig galls on *Quercus aliena* Blume var. *acutiserrata* Maxim. (section *Quercus*). The gall (Fig. 1i–j) is a swelling on branches and twigs, usually located in the middle of the twig, not apically; sometimes swellings are at joints of twigs; up to 3 cm long, 1.5–1.8 cm in diameter, the same colour as the bark of twigs. When the gall is mature, tissues are hard and lignified. Larval chambers are arranged perpendicularly to main axis of gall, radiating from center of twig toward gall surface, reaching to 2–3 mm from surface. Mature galls were collected in late June, adult inquilines emerged under laboratory conditions immediately after gall collecting.

Etymology. The new species is named after the reticulate mesopleuron.

4. Discussion

The genus *Saphonecrus* was established by Dalla Torre and Kieffer (1910) for the oak inquiline species with an open radial cell. Pujade-Villar and Nieves-Aldrey (1990) revised the European species and maintained the genus, but also questioned its validity. Although the separation of this

genus from *Synergus* has subsequently been widely questioned (Eady & Quinlan 1963, Ritchie 1984, Pujade-Villar & Nieves-Aldrey 1990), the two genera have never been formally synonymized.

Penzés *et al.* (2012) consider *Saphonecrus* to be polyphyletic and closely allied to *Synergus*. Indeed, Gorge Melika & Juli Pujade-Villar have been trying for a long time, still unsuccessfully, to establish the limits between *Synergus-Saphonecrus* and some genera still not described which would include species now belonging to *Synergus* or to *Saphonecrus*. This is a complex problem which has to take into account all the variation in the group. The species now described, *Saphonecrus reticulatus* sp. n. may be an important link of this conflict. On the other hand, the solution of the complex *Synergus-Saphonecrus* in monophyletic groups is far away of being solved, because, until now, the molecular analyses have not given a clear indication for resolving the conflict. But this fact should not prevent to describe peculiar species in this group as has happened in recent years (*Saphonecrus*: *S. flavitibialis* Wang & Chen, 2010, *S. tianmushanus* Wang & Chen, 2010, *S. yukawai* Wachi, Ide & Abe, 2011, *S. hupingshanensis* Liu *et al.* 2012; *Synergus*: *S. baruensis* Nieves-Aldrey & Medianero, 2011, *S. chiricanus* Nieves-Aldrey & Medianero, 2011, *S. elegans* Nieves-Aldrey & Medianero, 2011, *S. itoensis* Abe *et al.* 2011, *S. castaneus* Pujade-Villar, Bernardo & Viggiani, 2013, among others). These are important advances in the knowledge of the group.

The species described in this study is very unusual, because it has the mesopleura with reticulate sculpture. This sculpture is not present in any other known species of *Synergus* and *Saphonecrus*. Except this character, there is no doubt that this is a *Saphonecrus* species (understanding this as an inquiline morphological group, currently recognized). The reticulated mesopleura is present only in an undescribed genus collected in galls induced in *Lithocarpus*; the description of this genus is in this moment under evaluation for publication. The species described here doesn't belong to this related new genus according to its host plant (the new species was not collected in *Lithocarpus* galls but *Quercus* galls) and according to its specific morphological characters.

In conclusion, the variability of *Saphonecrus* 'sensu lato' is expanded with the description of this new species.

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References

- Abe, Y., Ide, T. & Wachi, N. 2011: Discovery of a New Gall-Inducing Species in the Inquiline Tribe Synergini (Hymenoptera: Cynipidae): Inconsistent Implications from Biology and Morphology. — *Annals of the Entomological Society of America* 104: 115–120.
- Bernardo, U., Gebiola, M., Xiao, Z., Zhu, C. D., Pujade-Villar, J. & Viggiani, G. 2013: Description of *Synergus castaneus* n. sp. (Hymenoptera: Cynipidae: Synergini), associated with an unknown gall on *Castanea* spp. (Fagaceae) in China. — *Annals of the Entomological Society of America* 106(4): 437–446.
- Dalla Torre, K. W. & Kieffer, J. J. 1910: Cynipidae. Das Tierreich, 24. Berlin, Friedlander & Sohn 35: 1–891.
- Eady, R. D. & Quinlan, J. 1963: Hymenoptera: Cynipoidea. key to families and subfamilies and Cynipinae (including galls). — *Handbooks for the Identification of British Insects* 8(1a): 1–81.
- Harris, R. 1979: A glossary of surface sculpturing. State of California, Department of Food and Agriculture. — *Occasional Papers of Entomology* 28: 1–31.
- Liljeblad, J. & Ronquist, F. 1998: A phylogenetic analysis of higher-level gall wasp relationships (Hymenoptera: Cynipidae). — *Systematic Entomology* 23: 229–252.
- Liu, Z., Yang, X. H., Zhu, D. H. & He, Y. Y. 2012: A New Species of *Saphonecrus* (Hymenoptera, Cynipoidea) Associated with Plant Galls on *Castanopsis* (Fagaceae) in China. — *Annals of the Entomological Society of America* 105(4): 555–561.
- Melika, G. 2006: Gall Wasps of Ukraine. Cynipidae. — *Vestnik Zoologii, Suppl.* 21(1): 1–300.
- Penzes, Z., Melika, G., Bozsoki, Z., Bihari, P., Miko, I., Tavakoli, M., Pujade-Villar, J., Feher, B., Fulop, D., Szabo, K., Bozso, M., Sipos, B., Somogyi, K. & Stone, G. 2009: Systematic reappraisal of the gall-usurping wasp genus *Synophrus* Hartig, 1843 (Hymenoptera: Cynipidae: Synergini). — *Systematic Entomology* 34: 688–711.
- Penzes, Z., Tang, C. T., Bihari, P., Bozsó, M., Schwéger S. & Melika, G., 2012: Oak associated inquilines (Hymenoptera, Cynipidae, Synergini). — *TISCIA monograph series* 11, Szeged (Hungary), 76 pp.
- Pujade-Villar, J., Melika, G., Ros-Farre, P., Ács, Z. & Csoka, G. 2003: Cynipid inquiline wasps of Hungary, with taxonomic notes on the Western Palearctic fauna (Hymenoptera: Cynipidae, Cynipinae, Synergini). — *Folia Entomologica Hungarica* 64: 121–170.
- Pujade-Villar, J., & Nieves-Aldrey, J. L. 1990: Revisión de las especies europeas del género *Saphonecrus* Dalla Torre y Kieffer, 910 (Hym., Cynipidae, Cynipinae). — *Butlletí de la Institució Catalana d'Història Natural (Ser. Zool.)* 58: 45–55.
- Ritchie, A. J. 1984: A review of the higher classification of the inquiline gall wasps (Hymenoptera: Cynipidae) and a revision of the Nearctic species of *Periclistus* Förster. Ph. D. diss. Carleton University, Ottawa.
- Ronquist, F. & Nordlander, G. 1989: Skeletal morphology of an archaic cynipoid, *Ibalia rufipes* (Hymenoptera: Ibaliidae). — *Entomological Scandinavica supplement* 33: 1–60.
- Wang Y. P., Chen X. X., Pujade-Villar, J., Wu, H. & He, J. H. 2010: The genus *Saphonecrus* Dalla Torre et Kieffer, 1910 (Hymenoptera: Cynipidae) in China, with descriptions of two new species. — *Biologia* 65(6): 1034–1039.