

# Rediscovery and redescription of the holotype of *Stephanus (Distephanus) [sic!] atthesinus* Biegeleben, 1929, with comments on its identity and new distributional data for *Megischus anomalipes* (Förster, 1855) (Hymenoptera, Stephanidae)

Key words: Hymenoptera, Stephanidae, *Stephanus (Distephanus) [sic!] atthesinus* Biegeleben holotype, synonymy, *Megischus anomalipes* (Förster), distribution.

## Riassunto

Ritrovamento e ridescrizione dell'olotipo di *Stephanus (Distephanus) [sic!] atthesinus* Biegeleben, 1929, con commento sulla sua identità e nuovi dati corologici su *Megischus anomalipes* (Förster, 1855) (Hymenoptera, Stephanidae)

Viene segnalato il ritrovamento dell'olotipo di *Stephanus (Distephanus) [sic!] atthesinus* Biegeleben, 1929, conservato presso il Museo di Storia Naturale di Venezia (Italia), del quale si forniscono una ridescrizione ed un commento sulla sua identità tassonomica. Viene pertanto confermata la sinonimia con *Megischus anomalipes* (Förster, 1855). Si riportano nuovi dati sulla distribuzione: viene segnalata per la prima volta per le regioni italiane del Veneto, Emilia-Romagna, Toscana e Basilicata e risulta nuova per la Grecia.

## Abstract

The rediscovery of the holotype of *Stephanus (Distephanus) [sic!] atthesinus* Biegeleben, 1929, preserved in the collections of the Museo di Storia Naturale, Venice (Italy), is recorded together with a redescription and a comment on its taxonomic identity. Therefore, its synonymy with *Megischus anomalipes* (Förster, 1855) is confirmed. New distributional data for *M. anomalipes* is provided: it is recorded for the first time from the Italian regions of Veneto, Emilia-Romagna, Tuscany and Basilicata, and newly recorded from Greece.

## Introduction

Stephanidae Leach, 1815 is a cosmopolitan family of Hymenoptera mainly occurring in tropical and subtropical areas, with 346 described species, including fossils (AGUIAR, 2004, 2005, 2006; VAN ACHTERBERG & YANG, 2004; AGUIAR & JENNINGS, 2005; VAN ACHTERBERG & QUICKE, 2006; AGUIAR *et al.*, 2010; HONG *et al.*, 2010; HONG & XU, 2011; TAN *et al.*, 2015). Stephanids are usually medium- to large-sized parasitoid wasps, reaching 100 mm in length (including ovipositor) in the genera *Megischus* Brullè, 1846 and *Profoenatopus* van Achterberg, 2002 (AGUIAR, 2005). They can be easily recognized by the presence of a conspicuous 'crown' or 'corona' on the head, consisting of five more or less developed tooth-like processes on the frons, a very slender body, the pronotum elongate and sub-conical, the hind legs highly modified, with all segments swollen to widened, the hind femur bearing large ventral tooth-like processes. Stephanids are considered to be rare or extremely localized, but this is probably due to their cryptic colour pattern and behavior, with adults preferring walking up and down

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close to tree bark (TURRISI, personal observation). This fact is deeply reflected in the taxonomic knowledge of the family, with some 95% of described species based on a single specimen (HONG *et al.*, 2011).

The biology of Stephanidae is poorly known. They can be found near dead tree trunks or branches for about one year inhabited by beetle larvae and not yet infested by fungi (VAN ACHTERBERG, 2002). They are idiobiont ectoparasitoid, feeding on wood boring larvae (TAYLOR, 1967). Their hosts are coleopterous larvae, mainly of Buprestidae (e.g., TOWNES, 1949; CHAO, 1964; PAGLIANO, 1986; BRAZA, 1989; TURRISI, 2002) and Cerambycidae (e.g., BLÜTHGEN, 1953; VÖLLGER, 1994; VISITPANICH, 1994; TURRISI, 2002), but there are also records of other families of Coleoptera, as well as for Hymenoptera Siricidae and solitary Apoidea as possible hosts (AGUIAR, 2005; HONG *et al.*, 2011). In order to detect their hosts, BROAD & QUICKE (2000) and VILHELMSSEN *et al.* (2001) proved that many Hymenoptera are able to produce vibration signals by tapering the substrate with their antennae. The echoes are detected by an enlarged subgenual organ of the legs. By dissecting the hind tibia, VAN ACHTERBERG (2002) found part of a supposed subgenual organ, although roughly identified and illustrated. Stephanid wasps seem to drum during the search for hosts (RODD, 1951), but females do not have modified antennal tips for beating the substrate (VILHELMSSEN *et al.*, 2008). VILHELMSSEN *et al.* (2008) described the subgenual organ of stephanids in detail, suggesting that they are able to use passive vibration detection, monitoring sound produced by potential hosts.

In the present paper, we clarify and confirm the synonymy of *Stephanus* (*Distephanus*) [sic!] *athesinus* (Biegeleben, 1929) with *Megischus anomalipes* (Förster, 1855) through the redescription of the rediscovered holotype. We also update the Italian distribution of *Megischus anomalipes* and provide new records from Europe and NW Asia.

### *Taxonomic situation of the European Stephanidae*

Only two species of Stephanidae, namely *Stephanus serrator* (Fabricius, 1798) and *Megischus anomalipes* (Förster, 1855), are known from Europe (MADL, 2013). The former species is known from Central and South Europe, except Portugal, Albania and Greece (VAN ACHTERBERG, 2002). In Italy, the species occurs all over the mainland, including Sicily and Sardinia (PAGLIANO, 1986; TURRISI, 2002). Conversely, *Megischus anomalipes* shows a fragmentary distribution in South Europe and North-West Asia (TURRISI, 2002; VAN ACHTERBERG, 2002; MADL, 2013).

*Megischus anomalipes* was first described from Hungary as *Stephanus anomalipes*. SICHEL (1860) described *Bothrioceros europaeus* (junior subjective synonym of *M. anomalipes*) based on a single female from Sicily. Later, SICHEL (1865) transferred the species under the genus *Megischus*, and Schletterer (1889) updated the distribution of the species. BIEGELEBEN (1929) described *Stephanus* (*Distephanus*) [sic!] *athesinus* (currently a junior synonym of *M. anomalipes*) based on a female from Bolzano, but the holotype was not located subsequently and thus believed to be lost. VAN ACHTERBERG (2002) redescribed *Megischus anomalipes* on a single female from France, and TURRISI (2002) provided the first description of the male.

### *Materials and methods*

The material includes specimens from the Museo di Storia Naturale di Venezia (MSNVE), and Dal Pos D. and Turrisi G.F. private collections. Holotype data label are quoted *verbatim*, i.e. without interpretation; a slash (/) indicates the end of a line, two slashes (//) mean the beginning of another label.

A dissecting stereomicroscope (OPTIKA SZM-2) was used for observation and study. Photographs were taken by a Canon Eos 600D, lens Canon MP-E 65mm f/2.8 1-5x Macro and Sigma 105mm f/2.8 Macro DG OS HSM, using Combine ZP for the stacking (HADLEY, 2008). The distribution map was produced by using QGIS 2.14.3 Essen. Morphological terms follow VAN ACHTERBERG (2002).

Acronyms for museums as repositories of primary types and other collections examined:

HNHM Hungarian Natural History Museum, Budapest, Hungary

MNHM Muséum National d'Histoire Naturelle, Paris, France

MSNVE Museo di Storia Naturale di Venezia, Venice, Italy

DPDC Dal Pos Davide, private collection, Ponte della Priula (Treviso), Italy

TGFC Turrisi Giuseppe Fabrizio, private collection, Pedara (Catania), Italy

#### Key to species of the European Stephanidae

1. Femal.....2
- Males.....3
3. Ventral margin of hind femur with 3 tooth-like processes (Fig. 6); distal half of hind tibia swollen (Fig. 6); hind tarsus 5-segmented; 1<sup>st</sup>-3<sup>rd</sup> tergites of metasoma reddish-brown, 4<sup>th</sup> tergite entirely black to reddish brown at base, tergites 5-8 entirely black (Fig. 5).....*Stephanus serrator*
- Ventral margin of hind femur with 2 tooth-like processes (Fig. 5); distal two thirds of hind tibia swollen (Fig. 5); hind tarsus 3-segmented; 1<sup>st</sup> tergite of metasoma extensively reddish brown, 2<sup>nd</sup> tergite red apically, otherwise black, tergites 3-8 entirely black (Fig. 1).....*Megischus anomalipes*
4. Ventral margin of hind femur with 3 tooth-like processes; distal half of hind tibia swollen; proximal median part of mid and hind basitarsi ivory; distal margin of 3<sup>rd</sup> hind tarsomere straight; 1<sup>st</sup> and 2<sup>nd</sup> tergites of metasoma extensively reddish-brown, 3<sup>rd</sup> tergite usually reddish-brown at base and then black or entirely red, 4<sup>th</sup> tergite entirely black to reddish-brown at base, tergites 5-8 entirely black; paramere, in lateral view, with regularly rounded distal margin .....*Stephanus serrator*
- Ventral margin of hind femur with 2 tooth-like processes; distal two thirds of hind tibia swollen; proximal half of mid and hind basitarsi ivory; distal margin of 3<sup>rd</sup> hind tarsomere sinuous; 1<sup>st</sup> tergite of metasoma extensively reddish-brown, tergites 2-8 entirely black; paramere, in lateral view, with pointed distal margin .....*Megischus anomalipes*

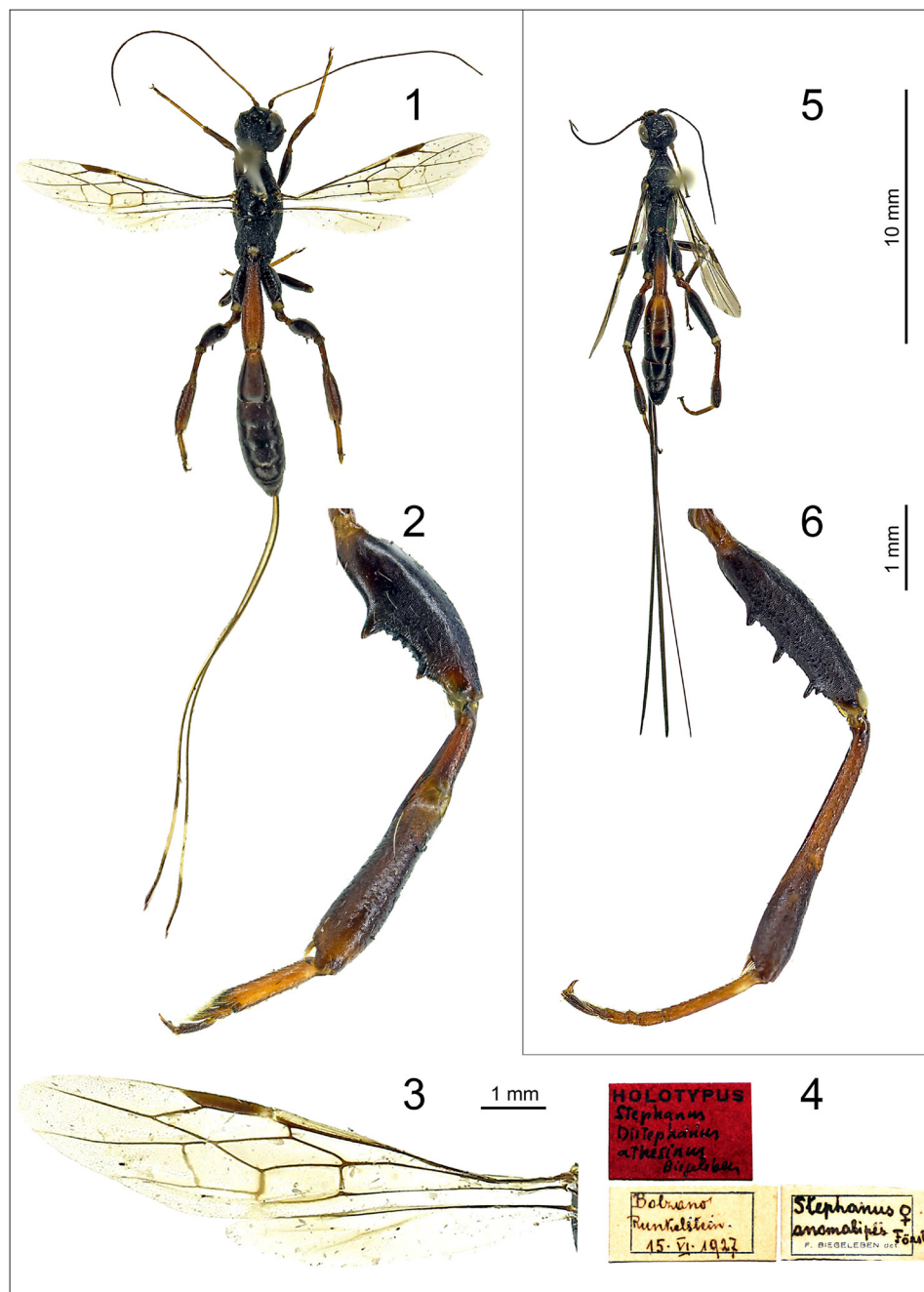
#### *Taxonomic account*

Genus ***Megischus*** Brullé, 1846

*Megischus* Brullé, 1846: 537. Type species: *Stephanus furcatus* LePeletier & Serville, 1825 [subsequent designation by Viereck, 1914]

*Bothrioceros* Sichel, 1860: 759. Type species: *Bothrioceros europaeus* Sichel, 1860 [subsequent designation by Aguiar, 2004]

The genus comprises 83 species worldwide (AGUIAR, 2004, 2006; VAN ACHTERBERG & YANG, 2004; VAN ACHTERBERG & QUICKE, 2006; HONG *et al.*, 2010), three of which from the Palearctic Region: *Megischus anomalipes* (Förster, 1855), *Megischus ptosimae* Chao, 1964 and *Megischus aplicatus* Hong, van Achterberg, Xu, 2010. *Megischus gigas* (Schletterer, 1899) occurs in Iran (MASNADI-YAZDINEJAD & LOTFALIZADEH, 2009), and has been transferred in the genus *Afromegischus* van Achterberg, 2002 by AGUIAR (2004). In Italy, only one species is recorded for the genus (SCARAMOZZINO, 1995; TURRISI, 2002).



Figs 1-4. Holotypus of *Stephanus (Distephanus) [sic!] athesinus* Biegeleben, 1929 (= *Megischus anomalipes* (Förster, 1855):  
1, habitus, dorsal view;  
2, hind leg, outer view;  
3, wings;  
4, original labels.

Figs 5-6. *Stephanus serrator* (Fabricius, 1798):  
5, habitus, dorsal view;  
6, hind leg, outer view.

***Megischus anomalipes*** (Förster, 1855) (Figs 1-4, 7)

*Stephanus anomalipes* Förster, 1855: 228, Holotype ♀ HNHM (type locality: Budapest, Hungary).

*Bothrioceros europaeus* Sichel, 1860: 750, 759. Holotype ♀ MNHN (type locality: Sicily, Italy). Synonymized by Madl (1991).

*Megischus europaeus*, Sichel, 1865: 484. ♀.

*Stephanus europaeus*, Schletterer, 1889a: 95. ♀.

*Megischus europaeus*, Scaramozzino, 1995: 3.

*Stephanus (Distephanus) [sic!] athesinus* Biegeleben, 1929: 210-214 (misspelling for *Diastephanus*). Holotype ♀ MSNVE (type locality: Bolzano, Italy). Synonymized by Madl (1991).

*Megischus athesinus* Scaramozzino, 1995: 3.

Fig. 7. Italian records of *Megischus anomalipes* (Förster, 1855), including published localities (green triangles) and new data (red circles); (\*) no precise locality given.



*Type material of* Stephanus (Distephanus) [*sic!*] *athesinus*. Holotype ♀, **Italy**: “Bolzano / Runkelstein / 15.vi.1927 // *Stephanus / anomalipes* Foerster / ♀ / F. BIEGELEBEN det. // HOLOTYPUS / *Stephanus / Distephanus / athesinus / Biegeleben*” (MSNVE) (Fig. 4).

The specimen is pinned in the mesonotum and it is in excellent condition, with only the last two tarsomeres of the right hindtarsus missing (Fig. 1).

*Additional material examined.* ITALY. **Veneto**: 1♀, Vicenza, Colli Berici, Monte del Prete, 4-22.VII.2013, D. Sommaggio leg. Malaise trap (DPDC); 1♀, Vicenza, Colli Berici, Monte Motton, 45°23'05"N 11°27'21"E, 23.VII-13.VIII.2013, D. Sommaggio leg. Malaise trap (DPDC); 1♂, same locality and collector, 13.VIII-2.IX.2013, Malaise trap (DPDC); 1♀, Vicenza, Colli Berici, Castegnero, 45°26'42"N 11°34'27"E, 13.VIII-2.IX.2013, D. Sommaggio leg. Malaise trap (DPDC); **Tuscany**: 1♂, Pisa, Lagoni Rossi, 43°03'49"N 10°48'05"E,

24.VII-3.VIII.2011, F. Strumia leg., Malaise trap (TGFC); 1♀, same locality, 3-13.VIII.2011, F. Strumia leg., Malaise trap (TGFC); 1♀, Pisa, Saline di Vol., 43°21'59"N 10°46'66"E, 16.VI-2.VII.2009, F. Strumia leg. (TGFC); 1♀, same locality and collector, 9-22.VII.2009 (TGFC); **Emilia-Romagna**: 1♂, Bologna, Monte San Pietro, San Martino, 27.V.2016, 44.483228°N 11.155754°E L. Scola leg. (DPDC); **Basilicata**: 2♀, 3♂, Potenza, San Paolo Albanese, Rive torrente Samento, 475 m a.s.l., 40°02'38"N 16°19'14"E, 4.I.2012, ex larva from *Spartium junceum*, emerged 12.VI.2012 (DPDC); **Sicily**: 2♀, Catania, Etna, Bosco Petrosino, 840 m a.s.l., ex larva from *Quercus cerris*, emerged during summer 2002, G.F. Turrisi leg. (TGFC); 1♀, 1♂, Catania, Etna: Belpasso, locality Timpazza, 650 m a.s.l., ex larva, from *Quercus congesta*, emerged 28.VI.2001, G.F. Turrisi leg. (TGFC); 1♀, same locality and collector, emerged 3.VII.2001 (TGFC); 8♀, 8♂, same locality and collector, from wood collected 11.II.2001, emerged summer 2001 (TGFC); 11♀, 4♂, same locality and collector, ex larva, from *Quercus congesta*, collected 11.II.2002, emerged 15-26.VI.2002 (TGFC); 1♀, Syracuse, Iblei, Carlentini, 400 m a.s.l., 5.V.2006, on dead tree of *Quercus suber*, G.F. Turrisi leg. (TGFC). GREECE: 1♂, Peloponnesus, Lakonia, 20 km S Sparti, Chania, 36°54'N 022°30'E, 5-6.V.2012, G. Agnoli & F. Izzillo leg. (DPDC). LEBANON: 1♂, Akkar prov., Fnaideq, 1300 m a.s.l., ex larva from *Quercus cerris*, emerged 10-30.VI.2000 together with *Chlorophorus yachovi*, P. Rapuzzi leg. (TGFC); 2♂, Chouf prov., Barouk, 1000 m a.s.l., ex larva emerged from *Quercus calliprinos* (= *Q. coccifera*) together with *Chlorophorus yachovi*, P. Rapuzzi leg. (TGFC); 3♀, 4♂, Jbail, Qartaba, 1300 m a.s.l., ex larva emerged from *Quercus* sp. together with *Chlorophorus yachovi*, and *Acmaeodera* spp., collected 6.VI.1999 and 4-15.V.2000, emerged 18.V.2000, 24.V.2000, 19.VI.2000, 17.VIII.2000, G. Sama leg. (TGFC).

*Distribution.* South-European with records from Spain, Madeira, France, Italy (including Sardinia and Sicily), Slovakia, Romania, Hungary, former Yugoslavia, Greece (**new**), and Lebanon (PAGLIANO, 1986; TURRISI, 2002; VAN ACHTERBERG, 2002, MADL, 2013).

*Redescription of* Stephanus (Distephanus) [*sic!*] atesinus. Holotype ♀, body length (excluding ovipositor): 15.3 mm; forewing length: 8.1 mm. *Colour.* Blackish brown; temples, vertex and pronotum dark brown; malar space with a yellowish brown patch; mid and hind coxae and femora dark brown; tarsi and first metasomal tergite reddish-brown; antenna (from second to sixth segments), humeral plate and rest of legs brown; wing weakly infuscate; ovipositor sheath brown, ivory part 0.9 times as long as dark apical part. *Head.* Antenna with 37 antennomeres, third antennomere 3.2 times its maximum width, fourth 1.12 times as long as third segment; frons rather convex, rugose-reticulate; three large, anterior, lobe-shaped coronal tooth-like processes, posterior two smaller and lobe-shaped; vertex slightly convex, rugose to transverse-carinate, with a strong carina; occiput transverse-carinate; occipital carina complete, ventrally not reaching base of mandible; temple concave just behind the eyes, then convex. *Mesosoma.* Neck stout, anteriorly concave, postero-dorsally flattened, with two strong complete transverse carinae; pronotal fold lacking; middle part of pronotum with eight weak, irregular transverse carinae; anteromedian carina of pronotum absent, mid part weakly separated from posterior part of pronotum, weakly convex latero-posteriorly; propleuron rugose laterally, without punctures; mesopleuron rugose, with sparse setosity; mesosternum smooth (only scattered punctures present), without setosity; convex part of metapleuron coarsely reticulate, glabrous; propodeum, axillae, posterior part of mesopleuron and scutellum densely reticulate; scutellar sulcus wide and crenulate. Fore wing with vein 1-M 4.6 times as long as vein 1-SR and 1.1 times vein m-cu; vein 2-RS 1.2 times as

long as vein r; vein r 0.2 times length of pterostigma, ending behind level of apex of pterostigma; crossvein between 2+3M and 2Cu present (Fig.). Hind coxa robust, irregularly rugose; hind femur robust, with two strong tooth-like processes, basal process larger than apical one, smaller processes in-between; basal part of hind tibia about one quarter as long as tibia, widened ventrally; hind basitarsus 3-segmented, parallel-sided, its ventral length 5.1 times its width. *Metasoma*. First tergite 3.8 times as long as its maximum width and 6.6 times its apical width, ending far behind level of hind coxa and narrowed apically, densely transverse-rugose, smooth in the basal part; second tergite, basally, with curved rugae, largely smooth; rest of second tergite and following tergites micro-sculptured; pygidial area well delimited, surrounded by a setose area; ovipositor sheath 2.3 times as long as forewing and 1.2 times as body length.

*Remarks.* MADL (1991) synonymized *Stephanus (Distephanus)* [sic!] *athesinus* Biegeleben, 1929 under *Megischus anomalipes* (Förster, 1855), without mentioning the holotype of Biegeleben. We assume that this synonymy was based solely on the description provided by BIEGELEBEN (1929). AGUIAR (2004) suggested that the holotype of *Stephanus (Distephanus)* [sic!] *athesinus*, was originally in the private collection of Biegeleben and then probably lost. VAN ACHTERBERG (2002) redescribed *M. anomalipes* from a single female specimen from France, without examining the type material. We rediscovered the holotype of BIEGELEBEN (1929) in the collection of the MSNVE, which allowed us to confirm the synonymy with *M. anomalipes*. BIEGELEBEN (1929) probably identified the specimen under *Megischus anomalipes* and only subsequently considered it as a new species (Fig. 4). The new species was based on the crossvein between veins 2+3M and 2Cu (Fig. 3) and the small tooth-like process between the basal and the apical robust processes of hind tibiae. According to AGUIAR (2004), both characters are variable, thus the differences observed by BIEGELEBEN (1929) are only due to individual variation. Other variations are the body length, which in the holotype is 15.3 mm, whereas 11.2 mm in the specimen examined by VAN ACHTERBERG (2002) and the antennal segments, which are 37 in the holotype and 32 reported by VAN ACHTERBERG (2002). Both these two characters perfectly fit with the variation recorded by MADL (1991): up to 16 mm in length and with up to 40 antennomeres. In Italy the species has been recorded only twice from Sicily (SICHEL, 1860; TURRISI, 2002) and once from Trentino Alto Adige (BIEGELEBEN, 1929), and there is a record from Sardinia without precise locality (MADL, 2013). We add herein records from additional four regions: Veneto (**new**), Tuscany (**new**), Emilia-Romagna (**new**) and Basilicata (**new**). The record from Veneto confirms the occurrence of this species in the North-East Italy, 87 years after the previous record (BIEGELEBEN, 1929). The record from Basilicata represents the first finding of this species from South Italy. The current distribution of the species in Italy is summarized in Fig. 7. Additionally, we report the species for the first time from Greece.

*Biology.* The biology of *Megischus anomalipes* is poorly known. SICHEL (1860) collected a female in September, BIEGELEBEN (1929) a female in June in a oak wood. TURRISI (2002) reported three possible hosts of specimens collected in Sicily, associated with dead wood of *Quercus congesta* C. Presl. in J. & C. Presl.: *Acmaeoderella adspersula* (Illiger, 1803), *Anthaxia hungarica* (Scopoli, 1772) (Buprestidae) and *Trichoferus fasciculatus* (Faldermann, 1837) (Cerambycidae), and two possible hosts of specimens collected in Lebanon associated with *Quercus* sp.: *Chlorophorus yachovi* Sama 1996 (Cerambycidae) and *Acmaeodera* sp. (but probably, more than one species, as indicated in the original label of the specimens from Qartaba) (Buprestidae). The new data highlights the relationships with other *Quercus* species: *Q. coccifera* L., *Q. cerris* L. and *Q. suber* L., and confirms

*Chlorophorus yachovi* as possible host (see material for detail). The specimens collected in Basilicata are associated with *Spartium junceum* L., and those from Veneto were collected in two different sites: a wild meadow at the border of a mixed coniferous and oak wood (Monte Motton) and a mixed wood subjected to anthropogenic cut (Castegnero).

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