New or little-known bees from Sicily (Hymenoptera: Apoidea)

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Abstract
The authors report newly recorded species of bees (Hymenoptera, Apoidea) on the Volcan Etna (Sicily). A total of ten species belonging to three families are recorded: Halictidae (8 species), Megachilidae (1 species), and Apidae (1 species). Pseudapis valga (Gerstaecker), Lasioglossum convexiusculum (Schenck) (Halictidae), Hoplitis laevifrons (Morawitz) (Megachilidae) and Tarsalia angyliformis Popov (Apidae), are reported for the first time for Sicily and the presence of other bee species is confirmed for the Island. Furthermore, this is the first record of the genus Tarsalia Morawitz for the fauna of Sicily. For each species data are given in relation to the altitudinal level, the plants visited, and the ecological quality of the sites where the specimens were found.

Key words: Halictidae, Megachilidae, Apidae, new records, Sicily.

Introduction
Sicily represents a place of great interest for the study of plants and animals, particularly for insects and is considered one of the most relevant biodiversity hotspots in the Mediterranean areas as a consequence of the paleogeographic connections with the surrounding lands that allowed repeated biocenotic exchanges in ancient times (Massa et al. 2011). The position of Sicily in the middle of the Mediterranean Sea, together with paleoclimatic and paleogeographic events, makes it one of the richest areas in biodiversity (Mazzeo et al. 2016). The biodiversity of the anthophilous insects is one of the most important indices to estimate the “health status” of a territory, either natural or anthropized, and to know the environmental changes that have occurred. Among the anthophilous insects, bees are also of great importance for the knowledge and protection of natural environments (Bella 2014) due to the relationships with visited plants.

Studies have been carried out by the Authors in eastern Sicily, in natural and cultivated ecosystems at different altitudes in the Mediterranean Basal (0-1450 m), and Mountain-Mediterranean plans (1450-2100 m), for a period of 11 years collecting and/or recording bees on flowers (Mazzeo et al. 2004, 2007a). The results of these investigations showed that the majority of the insects belonged to Hymenoptera Apoidea and to the family Apidae (Mazzeo et al. 2007b, 2015, 2019; Quaranta et al. 2004; Seminara et al. 2009). Overall, about 180 species have been collected, belonging to the families Colletidae, Andrenidae, Halictidae, Melittidae, Megachilidae, and Apidae.

Recent new records from Sicily have been published by Mazzeo et al. (2004), who recorded Bombus silvestris Lepelletier; Seminara et al. (2009), who recorded Lasio glossum costatum (Kriechbaumer) and Lasio glossum fratellum Pérez; Nobile & Turrisi (2015, 2016), who recorded 8 Halictidae and 10 Nomada Scopoli species, respectively; Haris & Józan (2018), who recorded Nomada glaucopis Pérez; and Nobile et al. (2015), who recorded 7 species of Andrena F. Furthermore, new species have been also described (Nobile & Turrisi 2004).

In this paper the authors report newly recorded species of bees for Sicily.

Materials and methods
The observations were carried out in sites characterised by different climatic and vegetational aspects, with variations in altitude and exposure around the volcano Etna (eastern Sicily). The climates are thermo-mediterranean, with an annual average temperature around 18 °C in the site of Contrada Primosole (Catania), meso-mediterranean, with average temperatures between 12 and 16 °C in the sites.
of Bronte, and Milia (Mt San Leo), and oro-mediterranean, with average temperatures ≤8 °C in the site of Piano Provenzana (Mt Tanaurpi). These areas, based on floristic composition and the degrees of human and agronomic aspects, were defined as:
- agro-ecosystems [AE], in the site of Bronte, 37.48N 14.47E, 625 m, characterised by large areas cultivated with peach and pear, surrounded by oak forests;
- natural ecosystems [NE], in the site of *Piano Provenzana, Mt Tanaurpi (Linguaglossa), 37.47N 15.02E, 1845 m, characterised by pioneer vegetation, rich in plants of high ecological value and the presence of many endemic species;
- semi-natural ecosystems [SN], in the site of **Contra-da Primosole (Catania), 37.23N 15.05E, 3 m, and in the site of *Milia, Mt San Leo (Belpasso), 37.39N 14.59E, 1046 m, characterised by agro-ecosystems cultivated with pome and stone-fruit orchards with an abundance of wildflowers.

The sites marked with the symbol * are in the protected territories of the Etna Park and the sites with ** are in the ‘Oasi del Simeto’ Nature Reserve.

Bee species were recorded along a transect of 400-600 m, representative of the spontaneous flora that were preliminarily defined in the surveyed areas.

The distribution, locality and date of capture, number of specimens observed, the plants visited, and collector are reported for each species. Each specimen was prepared dry and identified to species after the observation of sexual structures.

For the identification of the species, the works of Friese (1911), Schmiedeknecht (1930), Ebmer (1969, 1970, 1971, 1974), and Warncke (1980) are used. Furthermore, for each species the citations in the literature for Sicily and/or Mount Etna are reported. Reference was made to the online check-list of Western Palearctic Bees for Sicily and/or Mount Etna are reported. Reference was

Results and discussion

The following four species of bees are reported here as new for Sicily: Pseudapis valga (Gerstäcker), Lasioglossum convexiusculum (Schenck), Hylaeus tetrazonius (Kriechbaumer) with four visited plant families (Asteraceae, Fabaceae, Rosaceae, and Scrophulariaceae). Moreover, these bee species were also the most numerous, whereas the other recorded species were represented by only one, two, or three specimens (Table 1).

Detected taxa

**Halictidae** Thomson 1869

*Nomiiinae* Robertson 1904

**Pseudapis** Kirby 1900

**Pseudapis valga** (Gerstäcker 1872)

? *Apis valga* Gerstäcker 1872 – Stettin. ent. Ztg., 33. Examinad specimens: Mount Etna, Piano Provenzana, 16.VI.2007, 1 ♀, on *Astragalus siculus* Biv. (Fabaceae), S. Bella & A. Seminara leg. New for Sicily.

*Distribution*: South-European-Central-South-Asian. 
*Range in Italy*: Sardinia (Alfken 1938).

**Halictinae** Thomson 1869

**Halictus** Latreille 1804

**Halictus (Monilapis) tetrazonius** (Klug 1817)

*Hylaeus tetrazonius* Klug 1817 – In German, Reise nach Dalmat., 2: 265. 

*Halictus tetrazonius* Strand 1909: 17 (Sicily). Examinad specimens: Mount Etna, Piano Provenzana, 11. VIII.2005, 1 ♀, on *Senecio aethnensis* Jan ex DC. (Asteraceae), S. Bella & A. Seminara leg. 

*Distribution*: Circummediterranean. 
*Range in Italy*: this species is present in the regions of northern and central Italy, in Sardinia, and in Sicily.

**Lasioglossum** Curtis 1833

**Lasioglossum (Dialictus) aeratum aeratum** (Kirby 1802)

Melitta aerata Kirby 1802 – Monogr. apum Angl., 2: 58.
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Lasioglossum (Dialictus) aeratum, Nobile & Turrisi 2015: 40 (Sicily: Mt Etna).
Examined specimens: Mount Etna, Piano Provenzana, 13.VII.2007, 1 ♂, on Tanacetum siculum (Guss.) Strobl (Asteraceae), S. Bella & A. Seminara leg.
Distribution: Medio-South-West-Palaearctic-Central-South-West-Asian.
Range in Italy: this species is known for the regions of northern and central Italy, in Sardinia, in and in Sicily.

Lasioglossum (Dialictus) brevicorne brevicorne (Schenck 1870)

Halictus brevicorne Schenck 1870 – Jb. nassau. Ver. Naturk, 21/22: 310.
Lasioglossum (Hemihalictus) brevicorne, Nobile & Turrisi 2015: 40 (Sicily: Mt Etna).
Examined specimens: Mount Etna, Piano Provenzana, 11.VIII.2005, 1 ♂, on Lactuca vimenina (L.) J. & C. Presl (Asteraceae), S. Bella & A. Seminara leg.; Piano Provenzana, 16.IX.2005, 1 ♂, on Senecio aethnensis, S. Bella & A. Seminara leg.
Distribution: Macaronesian-West-Palaearctic-West-Asian.
Range in Italy: this species is present in the peninsular Italy, in Sardinia, and in Sicily.

Lasioglossum (Dialictus) leucopus (Kirby 1802)

Melitta leucopus Kirby 1802 – Monogr. apum Angl., 2: 59.
Lasioglossum (Dialictus) leucopus, Nobile & Turrisi 2015: 40 (Sicily: Mt Etna).
Examined specimens: Mount Etna, Piano Provenzana, 19.VI.2007, 1 ♀, on Astragalus siculus; idem, 1 ♀, on Erysimum etnense Jord. (Brassicaceae); idem, 1 ♀, on Scrophularia canina L. (Scrophulariaceae); idem, 1 ♀, on Potentilla calabra Ten. (Rosaceae); Piano Provenzana, 10. VII.2007, 1 ♀, on Tanacetum siculum, S. Bella & A. Seminara leg.
Distribution: European-West-Asian.
Range in Italy: this species is discontinuously present in the Italian peninsula, and in Sicily.

Lasioglossum (Evylaeus) convexiusculum (Schenck 1853)

Hylaeus convexiusculum Schenck 1853 – Jb. Ver. Naturk. Nassau, 9: 166.
Examined specimens: Mount Etna, Piano Provenzana, 16.VI.2007, 2 ♀♀, on Senecio aethnensis, S. Bella & A. Seminara leg.
New for Sicily.
Distribution: Medio-South-European-Central-South-West-Asian.
Range in Italy: this species is known in the regions of northern and central Italy.

Lasioglossum (Evylaeus) fratellum fratellum (Pérez 1903)

Halictus fratellus Pérez 1903 – Proc.-verb. Soc. linn. Bordeaux, 58: 214.
Lasioglossum (Evylaeus) fratellum, Seminara et al. 2009: 114 (Sicily: Mt Etna).
Examined specimens: Mount Etna, Piano Provenzana, 12. IX.2007, 3 ♀♀, on Tanacetum siculum, S. Bella & A. Seminara leg.; Mount Etna, Bronte, 28.IX.2006, 1 ♂, on Pu-
licaria dysenterica (L.) Bernh. (Asteraceae), S. Bella leg.  
Distribution: European-Asian-Maghrebian.  
Range in Italy: this species is distributed throughout continental Italy, and in Sicily.

Lasioglossum (Lasioglossum) costulatum (Kriechbaumer 1873)

Halictus costulatus Kriechbaumer 1873 – Verh. zool.-bot. Ges. Wien, 23: 59.  
Lasioglossum (Lasioglossum) costulatum, Seminara et al. 2009: 114 (Sicily: Mt Etna).  
Examined specimens: Mount Etna, Piano Provenzana, 20. VII.2005, 1 ♂, on Rubus aetnicus Ten. (Rosaceae); idem, 1 ♀, on Linaria purpurea (L.) Miller (Scrophulariaceae); Piano Provenzana, 08.VIII.2007, 1 ♂, on Senecio glaber Ucria (Asteraceae), S. Bella leg.  
Distribution: Mediterranean (discontinuous in the southern part).  
Range in Italy: this species is distributed throughout continental Italy, and in Sicily.

MEGACHILIDAE Latreille 1802
Megachilinae Latreille 1802

Hoplitis Klug 1807

Hoplitis (Pentadentosmia) laevifrons (Morawitz 1872)

Osmia laevifrons Morawitz 1872 – Verh. zool.-bot. Ges. Wien, 22: 360.  
Examined specimens: Mount Etna, Milia, 20.VII.2005, 1 ♂, on Senecio aethnensis; idem, 1 ♂, on Astragalus siculus, S. Bella & A. Seminara leg.  
Distribution: West-Palaearctic-West-Asian.  
Range in Italy: this species is distributed throughout continental Italy, and in Sicily.

APIDAE Latreille 1802
Apinae Latreille 1802

Tarsalia Morawitz 1895

Tarsalia (Tarsalia) ancyliformis Popov, 1935 (= Tetralonia hyblaeae Nobile 1993 syn. nov.)

Examined specimens: Contrada Primosole, 16.VII.2018, 1 ♂, on Carlina corymbosa L. (Asteraceae), R. Catania leg.  
Genus and species new for Sicily.  
Distribution: Western and Central Asia (Turkey, Israel, Turkmenistan, Uzbekistan, and Tajikistan) and Mediterranean islands of Sardinia and Cyprus (Engel et al., 2017).  
Range in Italy: Sardinia.  
Remarks: Tetralonia hyblaeae described by Nobile (1993) from Sicily (Hyblean Plateau, Mt Lauro, 750 m, 30.VII.1986, 1 ♀, 30.VIII.1988, 1 ♀), is here synonymised with T. ancyliformis. The new records reported here are significant because they expand the distribution of this rare species into the Mediterranean region. The taxon T. a. mediterranea was recently synonymised by Engel et al. (2017) in their diagnoses of the tribes Ancylaini and Tarsalini.

Final considerations

Bees constitute an important group of insects that contributes significantly to pollination of crops and wild plants. In Europe, this group is threatened by habitat changes resulting from agricultural activities, urban development, and changing climate (Bella & D’Urso 2012). A total of 9.2% of the species are threatened with extinction, and a further 5.2% are considered as ‘Near Threatened’ in the IUCN European Red List of Bees. For the majority of the species (56.7%) there was insufficient information to determine their status, and they have been classified as Data Deficient (Nieto et al. 2014). See also Quaranta et al. (2018) for recent data on the conservation status of Italian bees.

The availability of information is particularly scarce in southern European countries, where there is also considerable faunal biodiversity. Consequently, it is important to increase research to better understand the distribution, the population tendency and the ecology of these species.

This study lists new records and little-known bees from Sicily and includes notes on the distribution and plants visited of each species, so is a useful tool for students and researchers of bees.

Acknowledgements – We are grateful to Etna Park and the Metropolitan City of Catania for authorising the surveys in the Regional protected areas.

References

Altkn J.D. 1938. Contributi alla conoscenza della fauna entomologica della Sardegna. Apidae. Memorie della Società Entomologica Italiana, 16: 97–114.  
Bella S. 2014. Invasive insect pests and their associated parasitoids on ornamental urban plants on Corfu island - Phyto-riromyza jacarandae Steyskal and Spencer 1978 (Diptera, Agromyzidae) a new record in Greece. Hellenic Plant Protection Journal, 7: 53–59.  
Bella S., D’Urso V. 2012. First record in the Mediterranean basin of the alien leafhopper Balclutha brevis living on invasive Pennisetum setaceum. Bulletin of Insectology, 65 (2): 195–198.  
Comba M. 2019. Hymenoptera: Apoidea: Anthophila of Italy. Available from: http://digilander.libero.it/mario.comba [accessed 27 July, 2019].  
Ehmer A.W. 1969. Die Bienen des Genus Halictus Latr. s.l. im Großraum von Linz.(Hymenoptera, Apidae). Teil I. Naturkundliches Jahrbuch der Stadt Linz, 15: 133–184.
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Mazzeo G., Nucifora S., Russo A., Suma P., Longo S. 2007b. Osservazioni sugli apoidei e sull’attività di Apis mellifera in un’area altomontana del Parco dell’Etna. Apoidea, 4: 163–168.

Michener C.D. 2007. The bees of the world. Second edition. John Hopkins University Press; Baltimore, Maryland, 953 pp., + 20 pls.

Nieto A., Roberts S.P.M., Kemp J., Rasmont P., Kuhlmann M., Criado M.G., Biesmeijer J.C., Bogusch P., Dathe H.H., la Rúa P.D., De Meulemeester T., Dehon M., Dewulf A., Ortiz-Sánchez F.J., Lhomme P., Pauly A., Potts S.G., Praz C., Quaranta M., Radchenko V.G., Scheuchl E., Smit J., Straka J., Terzo M., Tomozei B., Window J., Michez D. 2014. European Red List of Bees. Publication Office of the European Union; Luxembourg City; x + 86 pp.

Nobile V. 1993. Gli Iblei: scritto di tesori faunistici. Grifone, organo dell’Ente Fauna Siciliana, 3: 2, 10.

Nobile V., Turrisi G.F. 2004. Contribution to the knowledge of cleptoparasitic Italian Bees. X. The genus Sphecodes Latreille, “pinguisculus” Pérez-group, with description of new species (Hymenoptera, Apoidea, Halictidae). Entomofauna, Zeitschrift für Entomologie, 25 (8): 117–129.

Nobile V., Turrisi G.F. 2015. New or little known Halictidae from Italy. Bollettino della Società Entomologica Italiana, 147 (1): 39–42.

Nobile V., Turrisi G.F. 2016. New or little known Nomada Scopoli from Italy (Hymenoptera, Apoidea, Apidae). Bollettino della Società Entomologica Italiana, 148 (2): 51–55.

Nobile V., Meloni C., Tomarchio S. 2015. Andrena nuove per la Sicilia e la Sardegna (Hymenoptera Andrenidae). 1. Bollettino della Società Entomologica Italiana, 137 (3): 223–228.

Polaszek A. 2013. Fauna Europaea: Apoidea. In: Mitroín M.-D. et al. 2013. Fauna Europaea: Hymenoptera – Apocryta. Fauna Europaea version 2.6. Available from: http://www.fauna-eu.org [accessed 24 July, 2019].

Quaranta M., Cornalba M., Biella P., Comba M., Battistoni A., Rondinini C., Teofili C. 2018. Lista rossa IUCN delle api italiane minacciate (IUCN Red List of Italian threatened bees). Comitato Italiano IUCN e Ministero dell’Ambiente e della Tutela del Territorio e del Mare, Roma.

Rasmont P., Haubruege E. 2015. Atlas Hymenoptera. Université de Mons, Gembloux Agro Bio Tech, Mons, Gembloux, Belgium. Available from: http://www.atlashymenoptera.net [accessed 25 July, 2019].

Schmiedeknecht O. 1930. Die Hymenopteren Nord und Mitteleuropas mit Einschluss von England, Südschweiz, Südost- und Ungarn. Nach ihren Gattungen und zum grossen Teil auch nach ihren Arten analytisch Bearbeitet. 2. Auflage, 1062 pp., Jena (Gustav Fischer).

Seminara A.R., Bella S., Mazzeo G., Longo S. 2009. Risultati di un triennio di studi sugli insetti antofili in un biotopo del vulcano Etna. Apoidea, 6 (2), 27-35: 110–116.

Strand E. 1909. Die paläarktischen Halictus-Arten des Kgl. Zoologischen Museums zu Berlin, z. T. nach Bestimmungen von J.D. Alfken. Archiv für Naturgeschichte, 75 (1): 1–62.

Warncke K. 1980. Die Bienengattungen Nomia und Systropha im Iran mit Ergänzungen zu den Nomia-Arten der Westpaläarktis. Linzer biologische Beiträge, 12 (2): 363–384.