Supplementary File S4. Compilation of host associations.

Host associations are presented as 'Species Author (Host family) (Reference)' or, in case of several host species, as 'Species_1 Author (Reference), Species_2 Author (Reference) (Family)'. Whenever necessary, we commented on published host associations, as several accounts are considered as not reliable or in need of further confirmation. We follow the systematics suggested by Bank *et al.* (2017), Sann *et al.* (2018), and Michener (2007) for vespid wasps, apoid wasps, and bees, respectively, and list hosts using their current names rather than the names provided by the authors who reported the host associations.

Family Bethylidae

Cephalonomia tarsalis
Reported hosts: *Oryzaephilus surinamensis* (Linnaeus) (Coleoptera: Sylvanidae) (Powell, 1938).

Family Chrysididae

Subfamily Amiseginae

***Adelphe* sp.**
Hosts: Unknown, but presumably Phasmatodea.
Comment: *Adelphe anisomorphae* Krombein 1960, a North American species, parasitizes the eggs of the phasmid *Anisomorpha ferruginea* (Palisot de Beauvois) (Pseudophasmatidae) (Krombein, 1960).

***Amisega* sp.**
Hosts: Unknown, but presumably Phasmatodea (see above).

Subfamily Cleptinae

Cleptes splendidus
Hosts: Unknown.

Cleptes nitidulus
Reported hosts: *Caliroa cerasi* (Linnaeus) (Tenthredinidae: Heterarthrinae) (Morgan, 1984).

Cleptes dahlbomi
Hosts: Unknown.

Cleptes putoni
Hosts: Unknown.

Cleptes striatipleuris
Reported hosts: Possibly *Nematus* Panzer (Tenthredinidae: Nematinae) (Fletcher, 1883; de Bormans, 1887; Nielsen, 1932).
Comment: Host information could refer to *Cleptes semiauratus* due to nomencatural confusion in respect to *Cleptes striatipleuris* and *Cleptes semiauratus* (Rosa *et al.*, 2015) and is therefore considered unreliable by us.

Cleptes semiauratus
Reported hosts: *Euura ribesii* (Scopoli) (Alfken, 1915), *Pristiphora abietina* (Christ) (Gauss, 1964),

Pristiphora incisa (Lindqvist) (Paukkunen *et al*., 2015) (Tenthredinidae: Nematinae). Also reported, but less credible, is *Endelomyia aethiops* (Gmelin) (Tenthredinidae: Heterarthrinae) (Burger & Sobczyk, 2011).

Subfamily Chrysidinae

Tribe Allocoeliini

Allocoelia capensis
Reported hosts: *Ceramius lichtensteinii* (Klug) (Brauns, 1910–1911; Gess & Gess, 2010), *Ceramius cerceriformis* de Saussure (Gess & Gess, 2010), *Ceramius jacoti* Richards, *Ceramius schulthessi* Brauns (Madl & Rosa, 2012, based on research by Gess & Gess) (Vespidae: Masarinae).

Allocoelia mocsaryi
Reported hosts: *Ceramius lichtensteinii* (Klug) (Madl & Rosa, 2012, based on research by Gess & Gess), possibly *Quartinia paradoxa* Brauns (Brauns, 1910–1911) (Vespidae: Masarinae).

Tribe Chrysidini

Argochrysis toralis
Hosts: Unknown for this species, but congeneric species are thought to parasitize ground-nesting *Ammophila* Kirby (Sphecidae) (Bohart & MacLaughlin, 1979; Rosenheim, 1989).

Caenochrysis doriae
Reported hosts: *Trypoxylon bidentatum* Fox (Parker & Bohart, 1966), *Trypoxylon frigidum* Smith and *Trypoxylon collinum rubrocinctum* (Packard) (Krombein, 1967), *Trypoxylon tridentatum* (Packard) (Bohart & Kimsey, 1982) (Crabronidae).

***Caenochrysis* sp.**
Hosts: Unknown.

Ceratochrysis perpulchra
Reported hosts: *Ammophila alberti* Hadelman (Sphecidae) (Hicks, 1932).

Chrysidea disclusa
Reported hosts: *Bembix bidentata* Van der Linden (Bembicidae) (Tormos *et al.*, 2009).
Comment: A confirmation of this host association is desirable, given the significant size difference between *Chrysidea disclusa* and its reported host and the fact that we collected *Chrysidea disclusa* mostly in habitat where the reported host does not occur. We currently consider this host assocation as uncertain and do not consider it in our study.

Chrysis amneris
Hosts: Unknown.

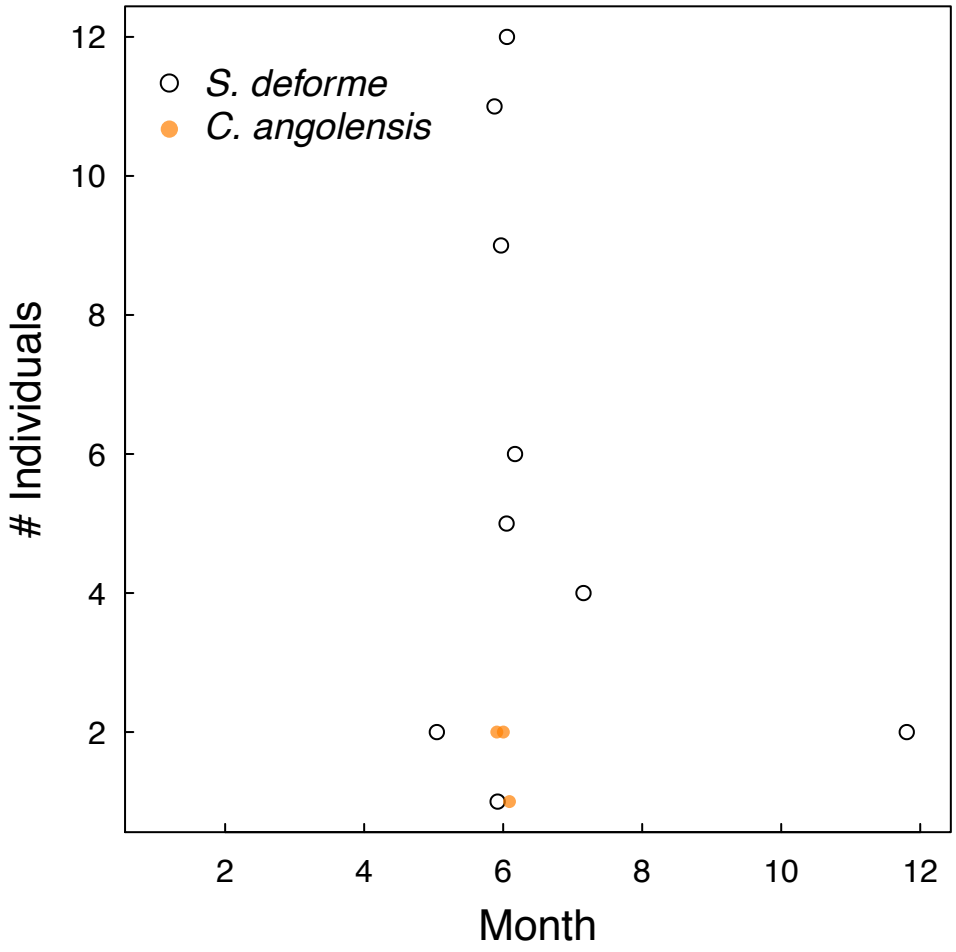
Chrysis analis
Reported hosts: *Anthidium punctatum* Latreille (Megachilidae: Megachilinae) (Wolf, 2000; Tischendorf & Frommer, 2004). Additional hosts mentioned in the literature are *Rhodanthidium caturigense* Giraud (Trautmann, 1927; Maneval, 1936; Berland & Bernard, 1938; Mingo *et al*., 1990), *Osmia niveata* (Fabricius) and *Osmia leaiana* (Kirby) (Heinrich, 1964), *Osmia andrenoides* Spinola (Berland & Bernard, 1938) (Megachilidae: Megachilinae). Also reported is *Euodynerus quadrifasciatus simplex* (Fabricius) (Berland & Berland, 1938) (Vespidae: Eumeninae).

Comment: We currently only consider the host association with *Anthidium punctatum* as reliable. *Rhodanthidium caturigense* serves as host of *Chrysis simplonica* (O. Niehuis, personal observations), a species not known to Trautmann, Maneval, Berland, and Bernard, and the reported association of *Chrysis analis* with this species should therefore be reassessed.

Chrysis angolensis

Reported hosts: *Sceliphron deforme* Smith (Sphecidae: Sceliphroninae).

Comment: We reared *Chrysis angolensis* (one male and four females) from four nests of *Sceliphron deforme* collected in trap nests from three locations (all within a 400m radius) at Xingangshan, Jiangxi Province, China (N29.085833°, E117.929722°), in June 2015 (Supplementary Fig. S4) (F. Fornoff, personal observations).



Supplementary Figure S4: Phenology of *Sceliphron deforme* and the cuckoo wasp *Chrysis angolensis*. Host nest cells (empty points) and parasitoid larva (orange filled points) found in trap nests showed synchronized phenology. All Hymenoptera nests were monthly sampled from trap nests exposed from August 2014 to July 2015 at the BEF-China field sites. In total 176 trap nests were installed, two within each of 88 plots, 40 plots on BEF-China experimental field site A and 48 on BEF-China experimental field site B. Data points shown represent the number of individuals (nest cells) found within one trap nest per collection month, host numbers include parasitized cells. For plotting we added random noise along the x-axis and used transparent colours, to show superimposing data points.

Chrysis angustula

Reported hosts: *Symmorphus bifasciatus* (Linnaeus) (van Lith, 1958; Niehuis, 2000; Pärn *et al.*, 2015; Paukkunen *et al.*, 2015), *Symmorphus allobrogus* (de Saussure), *Symmorphus connexus* (Curtis) and

Symmorphus debilitatus (de Saussure) (van Lith, 1958; Niehuis, 2000; Pärn *et al*., 2015), *Ancistrocerus trifasciatus* (Müller) (Pärn *et al*., 2015) (Vespidae: Eumeninae).

Chrysis apontis
Reported hosts: *Euodynerus foraminatus scutellaris* (de Saussure), *Ancistrocerus simulator* (Cameron), *Ancistrocerus catsckill* (de Saussure), *Parancistrocerus* Bequaert (Bohart & Kimsey, 1982) (Vespidae: Eumeninae).

Chrysis bequaerti
Hosts: Unknown.
Comment: Related North American species of the *C. smaragdula* species group are parasitoids of Vespidae (Eumeninae) (Bohart & Kimsey, 1982).

Chrysis bicolor
Reported hosts: *Tachysphex obscuripennis* (Schenck) and *Tachysphex pompiliformis* (Panzer) (Saure, 1998; Wickl, 2001) (Crabronidae). Also reported is *Dinetus pictus* (Fabricius) (Crabronidae) (Gauss, 1967).
Comment: While we consider the use of *Tachysphex* as hosts plausible, we consider it uncertain what specific species is parasitized.

Chrysis brachyceras
Hosts: Unknown.

Chrysis candens
Reported hosts: *Tachysphex nitidus* (Spinola) (Crabronidae) (Trautmann, 1927).
Comment: We consider this host information as unreliable, as closely related species parasitize vespid wasps (Vespidae: Eumeninae) rather than Crabronidae.

Chrysis castillana
Hosts: Unknown.

Chrysis cerastes
Hosts: Unknown.
Comment: Ivanov & Fateryga (2006) erroneously reported *Syneodynerus egregius* (Herrich-Schäffer) (Vespidae: Eumeninae) as host of *Chrysis cerastes* due to misidentification of the cuckoo wasp. The host information actually refers to *Chrysis ambigua* Radoszkowski (Martynova & Fateryga, 2015).

Chrysis ciscirtana
Hosts: Unknown.

Chrysis coeruleiventris
Reported hosts: probably *Megachile argentata* (Fabricius) (Megachilidae: Megachilinae) (du Buysson, 1894).

Chrysis comparata
Reported hosts: *Anthidium manicatum* (Linnaeus) (Megachilidae: Megachilinae) (Linsenmaier, 1959).

Chrysis consanguinea
Hosts: Unknown.

Chrysis corusca
Reported hosts: *Symmorphus gracilis* (Brullé) (Vespidae: Eumeninae) (Pärn *et al*., 2015).

Chrysis cortii
Reported hosts: *Miscophus bicolor* Jurine (Jacobs & Oehlke, 1990), *Miscophus niger* Dahlbom (Linsenmaier, 1959) (Crabronidae).
Comment: The use of *Miscophus bicolor* as host appears very plausible, as we collected *Miscophus bicolor* and *Chrysis cortii* repeatedly together. We also saw *Chrysis cortii* entering nests of *Miscophus bicolor* (O. Niehuis, personal observations).

Chrysis ehrenbergi
Hosts: Unknown.

Chrysis emarginatula
Reported hosts: *Ceramius lusitanicus* Klug (Berland & Bernard, 1938), *Ceramius tuberculifer* de Saussure (Mauss, 1996) (Vespidae: Masarinae).

Chrysis equestris
Reported hosts: *Discoelius dufourii* Lepeletier, *Discoelius zonalis* (Panzer) (Pärn *et al*., 2015; Paukkunen *et al*., 2015) (Vespidae: Zethinae).

Chrysis fasciata
Reported hosts: *Gymnomerus laevipes* (Shuckard) (Vespidae: Eumeninae) (Dufour & Perris, 1840; Giraud, 1863; Berland & Bernard, 1938; Linsenmaier, 1959; Kunz, 1994; S. Hopfenmüller, unpublished data; S. Tischendorf, unpublished data). Also reported are *Discoelius dufourii* Lepeletier, *Discoelius zonalis* (Panzer) (Vespidae: Zethinae) (Trautmann, 1927; Berland & Bernard, 1938; Blüthgen, 1961), *Euodynerus quadrifasciatus* (Fabricius) (S. Hopfenmüller, unpublished data), *Symmorphus murarius* (Linnaeus) (Heinrich, 1964) (Vespidae: Eumeninae), *Hoplitis tridentata* (Dufour & Perris) (Megachilidae: Megachilinae) (Trautmann, 1927; Berland & Bernard, 1938; Linsenmaier, 1959), *Ectemnius rubicola* (Dufour & Perris) (Crabronidae) (Berland & Bernard, 1938).
Comment: We only consider the reported host associations with vespid wasps reliable. As the reported associations with species of the genus *Discoelius* could refer to *Chrysis equestris*, a confirmation of these associations would be desirable.

Chrysis flamaryi
Hosts: Unknown.

Chrysis* cf. *filiafacialis
Hosts: Unknown.

Chrysis fugax
Hosts: Unknown.

Chrysis fulgida
Reported hosts: *Symmorphus allobrogus* (de Saussure) (Hopfenmüller, 2015), *Symmorphus bifasciatus* (Linnaeus) (Pärn *et al*., 2015), *Symmorphus crassicornis* (Panzer) (Wagner, 1938; Pärn *et al*., 2015), *Symmorphus murarius* (Linnaeus) (Trautmann & Trautmann, 1919; Pärn *et al*., 2015; Paukkunen *et al*., 2015) (Vespidae: Eumeninae). Also reported is *Ancistrocerus parietum* (Linnaeus) (Vespidae: Eumeninae) (Lamprecht, 1881).
Comment: We only consider the host association with species of the genus *Symmorphus* reliable.

Chrysis germari

Hosts: Unknown.

Comment: Whether *Tachysphex nitidus* (Spinola) (Crabronidae) serves as host of *Chrysis germani* (Trautmann, 1927) is unclear (Rosa, 2006). Trautmann (1927) reported *Tachysphex nitidus* as host of *Chrysis succincta*, without any further subspecific identification. Yet, Trautmann (1927) listed about 20 subspecies of *C. succincta*. *Tachysphex nitidus* could thus refer to any of these subspecies (nowadays valid species) and is therefore not clearly related to *Chrysis germari*. We consider the host information *Euodynerus dantici* (Rossi) (Vespidae: Eumeninae) (Berland & Bernard, 1938) as unreliable, as species of the *Chrysis succincta* species group are considered parasitoids of Crabronidae.

Chrysis gracillima

Reported hosts: Species of the genus *Microdynerus* Thomson (Vespidae: Eumeninae) (Friese, 1883; Enslin, 1929; Benno, 1950; Wickl, 2001), such as *Microdynerus exilis* (Herrich-Schäffer) (Bleidorn & Venne, 2000; Smit & Megens, 2008) and *Microdynerus nugdunensis* (Saussure) (O. Niehuis, personal observations) Also reported as host is *Trypoxylon clavicerum* Lepeletier & Serville reported (Crabronidae) (Morgan, 1984).

Comment: We only consider the use of *Microdynerus* species trustworthy.

Chrysis graelsii

Reported hosts: *Euodynerus notatus* (Jurine) (Herrmann, 1996; Klimsa, 2012; Pärn *et al*., 2015; Paukkunen *et al*., 2015; S. Tischendorf, personal observations), possibly also *Euodynerus quadrifasciatus* (Fabricius) (Saure, 1998; S. Hopfenmüller, unpublished data) and *Euodynerus disconotatus* (Lichtenstein) (Martynova & Fateryga, 2015) (Vespidae: Eumeninae).

Chrysis grohmanni

Reported hosts: Possibly *Tachysphex nitidus* (Spinola) (Mantero, 1899). Also reported are *Ectemnius dives* (Lepeletier & Brullé) (Crabronidae) (Berland & Bernard, 1938) and *Osmia tricornis* Latreille (Megachilidae: Megachilinae) (Linsenmaier, 1959a).

Comment: While we consider the use of *Tachysphex* as hosts plausible, we consider it uncertain what specific species is parasitized. Use of *Ectemnius dives* and *Osmia tricornis* as hosts appear implausible to us.

Chrysis ignita

Reported hosts: *Ancistrocerus antilope* (Panzer) (Kunz, 1994), *Ancistrocerus gazella* (Panzer) (Kunz, 1994), *Ancistrocerus nigricornis* (Curtis) (van Lith, 1953; Kunz, 1994), *Ancistrocerus oviventris* (Wesmael) (Bonelli, 1969), *Ancistrocerus parietinus* (Linnaeus) (Hobby, 1938), *Ancistrocerus parietum* (Linnaeus) (Chapman, 1869; du Buysson, 1896; Marechal, 1923; Morgan, 1984), *Ancistrocerus scoticus* (Curtis) (Morgan, 1984), *Ancistrocerus trifasciatus* (Müller) (Bonelli, 1969; Jacob-Remacle, 1976; Petit, 1987), *Symmorphus bifasciatus* (Linnaeus) (Enslin, 1921; Wagner, 1938; Linsenmaier, 1959; Blüthgen, 1961) (Vespidae: Eumeninae). Also reported as hosts, but very likely referring to other species of the *Chrysis ignita* species group are *Gymnomerus laevipes* (Shuckard) (du Buysson, 1896), *Odynerus spinipes* (Linnaeus) (Chapman, 1869), and *Euodynerus posticus* (Herrich-Schäffer) (Grandi, 1961) (Vespidae: Eumeninae).

Comment: While we consider it certain that *Chrysis ignita* uses Eumeninae of the genus *Ancistrocerus* as hosts, the in inconsistent taxonomic treatment of the species (*Chrysis ignita*) in the past makes it difficult to specify what species in the genus *Ancistrocerus* specifically serve as hosts. For example, a recent study (Pereira-Peixoto *et al*., 2016) reported a long list of vespid wasps (Vespidae: Eumeninae) plus the pemphredonid wasp *Passalaoeus eremita* as hosts of *Chrysis ignita*. However, as the list includes *Ancistrocrus nigricornis*, which is the host of *Chrysis terminata* (in

contrast to the other species in the respetive groups, inseminated females of *Ancistrocrus nigricornis* and *Chrysis terminata* hibernate), we have reason to belief that the identification of the species "*Chrysis ignita"* is not consistently correct. We also doubt that the pemphredonid wasp *Passalaoeus eremita* serves as host of *Chrysis ignita*, since there is compelling evidence for species of the *Chrysisi ignita* group being specialized in parasitizing vespid wasps.

Chrysis illigeri

Reported hosts: *Tachysphex pompiliformis* (Panzer) (Crabronidae) (Westrich, 1983; Morgan, 1984; Saure, 1998).

Comment: While we consider the use of *Tachysphex* as hosts possible, we consider it uncertain what specific species is parasitized.

Chrysis immaculata

Reported hosts: *Allodynerus rossii* (Lepeletier) (Vespidae: Eumeninae) (Lefeber, 1981).

Chrysis impostor

Hosts: Unknown.

Chrysis impressa

Reported hosts: *Ancistrocerus claripennis* (Thomson), *Ancistrocerus parietinus* (Linnaeus) (Martynova & Fateryga, 2015; Pärn *et al*., 2015; Paukkunen *et al*., 2015), *Ancistrocerus trifasciatus* (Müller) (Morgan, 1984; Pärn *et al*., 2015; Paukkunen *et al*., 2015) (Vespidae: Eumeninae).

Chrysis inaequalis

Reported hosts: *Eumenes coarctatus* (Linnaeus) (Kunz, 1994), *Eumenes coronatus* (Linnaeus) (Bettag, 1990), *Eumenes* sp. (Tischendorf & Frommer, 2004) (Vespidae: Eumeninae). Also reported is *Odynerus* (Berland & Bernard, 1938) (Vespidae: Eumeninae). We also received the information that *Chrysis inaequalis* was found fully developed, but dead, in a nest of *Delta unguiculata* (Villers) (Vespidae: Eumeninae) (G. Reder, personal communication).

Comment: The host information by Bettag (1990) and Kunz (1994) apparently refer to the same specimen. It is unclear whether the discrepancy in the species identity is due to a writing error or reflects a determination error. We here consider the information provided by Bettag (1990) as more credible, as his article also dealt with the identification of species in the genus *Eumenes*. The use of *Odynerus* species as hosts appears implausible to us.

Chrysis indigotea

Reported hosts: *Gymnomerus laevipes* (Shuckard) (Dufour & Perris, 1840; Berland & Bernard, 1938) (Vespidae: Eumeninae). Also reported is *Ectemnius rubicola* (Dufour & Perris) (Crabronidae) (Dufour & Perris, 1840). We reared *Chrysis indigotea* repeatedly from traps nests, in which *Allodynerus rossii* (Lepeletier) (Vespidae: Eumeninae) nested (O. Niehuis, personal observations).

Comment: Considering distributional information and the fact that we repeatedly reared only *Chrysis fasciata* from *Gymnomerus laevipes* nests makes us consider *Allodynerus rossii* as the most likely host of *Chrysis indigotea*.

Chrysis iris

Reported hosts: *Symmorphus allobrogus* (de Saussure) (Pärn *et al*., 2015; Paukkunen *et al*., 2015), *Symmorphus crassicornis* (Panzer) (du Buysson, 1896; Pärn *et al*., 2015; Paukkunen *et al*., 2015), *Symmorphus murarius* (Linnaeus) (Flügel, 2008; Tischendorf, 2011; Paukkunen *et al*., 2015; S. Hopfenmüller, unpublished data), possibly also *Symmorphus bifasciatus* (Pärn *et al*., 2015) (Vespidae: Eumeninae).

Chrysis lateralis
Hosts: Unknown.

Chrysis laodamia
Hosts: Unknown.

Chrysis leachii
Reported hosts: *Diodontus minutus* (Fabricius) (Pemphredonidae) (Jacobs & Oehlke, 1990; Gerth *et al*., 2010), *Miscophus bicolor* Jurine (Trautmann & Trautmann, 1919; Linsenmaier, 1959; Heinrich, 1964; Gerth *et al*., 2010), and *Tracheliodes quinquenotatus* (Jurine) (Grandi, 1961) (Crabronidae).
Comment: Given that *Chrysis cortii* very likely uses *Miscophus bicolor* as host, we consider the reported use of *Diodontus minutus* and *Tracheliodes quinquenotatus* as hosts not very well founded.

Chrysis leptomandibularis
Reported hosts: Possibly *Symmorphus debilitatus* (de Saussure) (Vespidae: Eumeninae) (Niehuis, 2000; Pärn *et al*., 2015).

Chrysis longula
Reported hosts: *Ancistrocerus antilope* (Panzer) (Morgan, 1984; Petit, 1987; Martynova & Fateryga, 2015). Possibly also *Ancistrocerus parietinus* (Linnaeus) (Morgan, 1984), *Symmorphus crassicornis* (Panzer) (Paukkunen *et al.*, 2015), *Symmorphus murarius* (Linnaeus) (Linsenmaier, 1959), and *Euodynerus posticus* (Herrich-Schäffer) (Martynova and Fateryga, 2015) (Vespidae: Eumeninae).
Comment: Host associations with *Diodontus tristis* Van der Linden (Pemphredonidae) and *Osmia bicornis* (Linnaeus) (= *O. rufa* (Linnaeus)) (Megachilidae) (Doronin, 1996) are unreliable (Rosa, 2006).

Chrysis maculicornis
Hosts: Unknown.

Chrysis marginata
Reported hosts: *Anthidium oblongatum* (Illiger) (Megachilidae: Megachilinae) (Hermann & Niehuis, 2015).

Chrysis martinella
Reported hosts: Species of the genus *Anthidium* Fabricius (Megachilidae: Megachilinae) (Linsenmaier, 1969).

Chrysis mediata
Reported hosts: *Odynerus spinipes* (Linnaeus) and *O. reniformis* (Gmelin) (Vespidae: Eumeninae) (Linsenmaier, 1959; Paukkunen *et al.*, 2015).
Comment: The use of *Odynerus reniformis* and other eumenine wasps as hosts should be reinvestigated, given the striking chemical adaptation of *Pseudochrysis neglecta* on *Odynerus spinipes* (Wurdack *et al*., 2016). Other host associations found in literature (*Ancistrocerus trifasciatus* (Müller), *Euodynerus notatus* (Jurine), and *Symmorphus debilitatus* (Saussure) (Vespidae: Eumeninae)) very likely refer to *Chrysis solida* Haupt (Pärn *et al.*, 2014).

Chrysis melpomene
Hosts: Unknown.

Chrysis mirabilis
Hosts: Unknown.

Chrysis mixta
Hosts: Unknown.
Comment: Trautmann (1927) mentions *Megachile parietina* as host of *Chrysis mixta*, referring to an observation made from Sicily reported by De Stefani (1888). However, there are no credible reports of *Chrysis mixta* occurring in Sicily. We therefore assume that the report by De Stefani (1888) likely referred to *Chrysis maderi* Linsenmaier, a species described in 1959 (Linsenmaier, 1959).

Chrysis mochii
Hosts: Unknown.

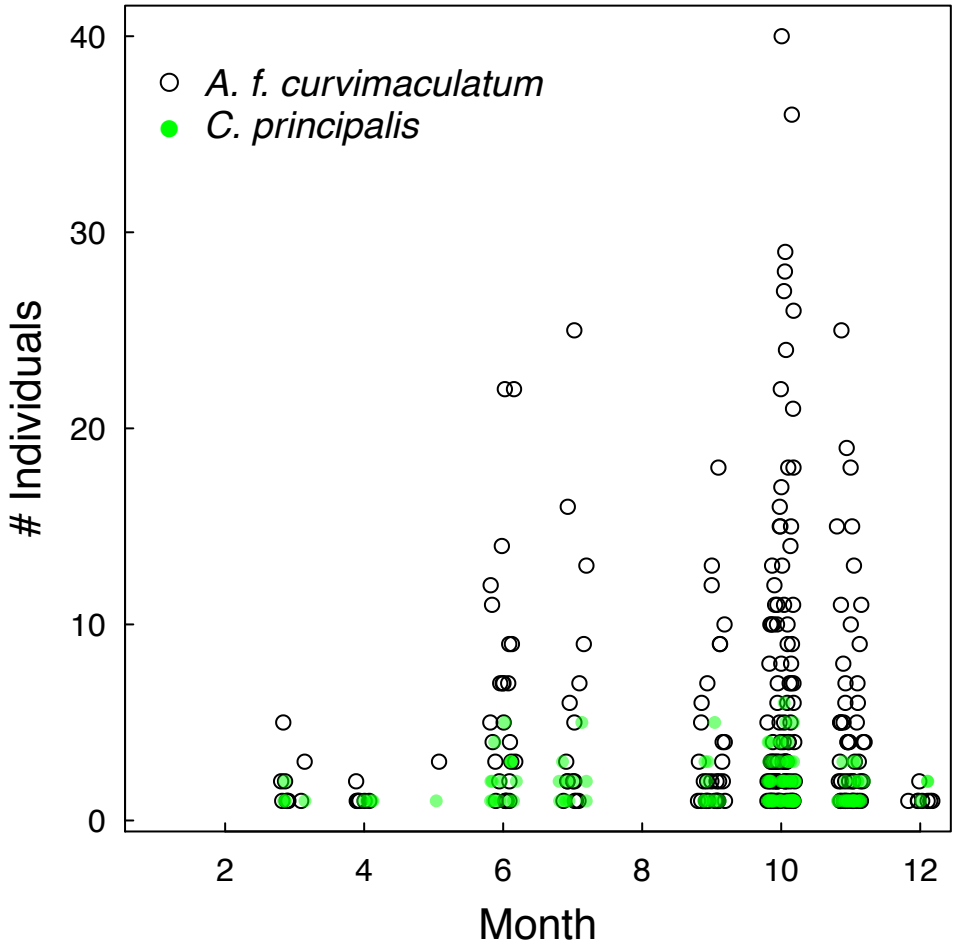
Chrysis opulenta
Hosts: Unknown.

Chrysis pallidicornis
Hosts: Unknown.
Comment: Linsenmaier (1968) considers species of the *Chrysis pallidicornis* species group to be parasitoids of Megachilidae.

Chrysis phryne
Reported hosts: *Osmia melanura* Morawitz (Megachilidae: Megachilinae) (Trautmann, 1927).

Chrysis pilosalateralis
Reported hosts: probably *Hoplitis wahrmanni* (Mavromoustakis) (Megachilidae: Megachilinae) (Linsenmaier, 1969).

Chrysis principalis
Reported hosts: *Anterhynchium flavomarginatum curvimaculatum* (Cameron) (Staab *et al.*, 2016; F. Fornoff, personal observations), *Anterhynchium flavomarginatum flavomarginatum* (Smith) (Staab *et al.*, 2016), *Orancistrocerus drewseni drewseni* (de Saussure) (M. Staab & F. Fornoff, personal observations), *Euodynerus (Pareuodynerus) quadrifasciatus* (Fabricius) (F. Fornoff, personal observations), *Pareumenes quadrispinosus transitorus* Liu (M. Staab & F. Fornoff, personal observations), *Eumenes quadratus urainus* Sonan (F. Fornoff, personal observations), and *Allorhynchium chinense* (de Saussure) (F. Fornoff, personal observations) (Vespidae: Eumeninae).
Comment: We reared 218 *Chrysis principalis* individuals form 2,228 host larvae of *Anterhynchium flavomarginatum curvimaculatum*, 29 individuals of *Chrysis principalis* from 264 larvae of *Orancistrocerus drewseni drewseni*, three individuals from 43 larvae of *Euodynerus quadrifasciatus*, three individuals from 61 larvae of *Pareumenes quadrispinosus transitorus,* two individuals from 30 larvae of *Eumenes quadratus urainus*, one individual from 190 larvae of *Allorhynchium chinense,* collected in trap nests near Xingangshan, Jiangxi Province, China (N29.105833°, E117.923611°), between September and December 2014 and between March and July 2015 (F. Fornoff, personal observations). In an earlier (from September 2011 to June 2013), but less exhaustive trap nest study at the same locality, *Chrysis principalis* was recorded from *Anterhynchium flavomarginatum curvimaculatum* (109 individuals from 1,365 host larvae), *Pareumenes quadrispinosus transitorus* (three individuals from 33 host larvae) and *Orancistrocerus drewseni drewseni* (two individuals from 120 host larvae) (M. Staab, personal observations). It appears that all large bodied Eumeninae found in trap nests at this location likely served as host for *Chrysis principalis*. The phenology of *Chrysis principalis* and *Anterhynchium flavomarginatum curvimaculatum* in our above study is depicted in Supplementary Fig. S5.



Supplementary Figure S5: Phenology of *Anterhynchium flavomarginatum curvimaculatum* and the cuckoo wasp *Chrysis principalis*. Host nest cells (empty points) and parasitoid larva (green filled points) found in trap nests showed synchronized phenology. All Hymenoptera nests were monthly sampled from trap nests exposed from August 2014 to July 2015 at the BEF-China field sites. In total 176 trap nests were installed, two within each of 88 plots, 40 plots on BEF-China experimental field site A and 48 on BEF-China experimental field site B. Data points shown represent the number of individuals (nest cells) found within one trap nest per collection month, host numbers include parasitized cells. For plotting we added random noise along the x-axis and used transparent colours, to show superimposing data points.

Chrysis propinquata
Hosts: Unknown.

Chrysis pseudobrevitarsis
Reported hosts: *Euodynerus notatus* (Jurine) (Pärn *et al.*, 2014; Paukkunen *et al.*, 2015), *Ancistrocerus antilope* (Panzer) (Vespidae: Eumeninae) (Morgan, 1984; Martynova & Fateryga, 2015), and probably also *Euodynerus quadrifasciatus* (Fabricius) (Heinrich, 1964).

Chrysis pseudoincisa
Hosts: Unknown.

Chrysis pulchella
Hosts: Unknown.

Chrysis ragusae
Hosts: Unknown.

Chrysis ramburi
Hosts: Unknown.

Chrysis remissa
Hosts: Unknown.

Chrysis rufitarsis
Hosts: Unknown.
Comment: In the last years, *Chrysis rufitarsis* has been repeatedly observed entering the nests of *Megachile* sp. and *Osmia* sp. (A. Petrioli, personal observations) (Megachilidae: Megachilinae) at Asciano, loc. Pecceta, Tuscany, Siena Province, Italy. *Chrysis rufitarsis* and the two bee species were the only aculeate Hymenoptera flying in spring at the studied badland clay site.

Chrysis rutilans
Reported hosts: *Gymnomerus laevipes* (Shuckard), *Katamenes flavigularis* (Blüthgen), *Ancistrocerus* Wesmael (Martynova & Fateryga, 2015), *Stenodynerus* de Saussure (Paukkunen *et al*., 2015), species of *Allodynerus* Blüthgen and *Microdynerus* Thomson (Tischendorf, 1998; Martynova & Fateryga, 2015), *Microdynerus nugdunensis* (de Saussure) (Tischendorf, 2000; Niehuis *et al.*, 2017) (Vespidae: Eumeninae).
Comment: The evidence for *Chrysis rutilans* using *Microdynerus nugdunensis* as host is very compelling while the evidence for it using any of the other above-mentioned species is comparatively weak. Future studies reporting other hosts should therefore indicate whether they can rule out the use of *Microdynerus nugdunensis* as host in the specific case.

Chrysis ruddii
Reported hosts: *Ancistrocerus oviventris* (Wesmael) (Berland & Bernard, 1938; Bonelli, 1969; Banaszak, 1980; Morgan, 1984; Petit, 1987; Kunz, 1994; Paukkunen *et al*., 2015), *Ancistrocerus parietum* (Linnaeus) (Berland & Bernard, 1938), *Ancistrocerus scoticus* (Curtis) (Petit, 1987), *Eumenes coronatus* (Panzer) (Martynova & Fateryga, 2015), *Delta unguiculatus* (Villers), *Eumenes coarctatus* (Linnaeus), *Leptochilus alpestris trinacriae* (André), *Odynerus spinipes* (Linnaeus), *Odynerus oviventris* (Wesmael), *Odynerus reniformis* (Gmelin) (Trautmann, 1927) (Vespidae: Eumeninae). Futhermore reported are *Hoplitis adunca* (Panzer) (Trautmann, 1927; Berland & Bernard, 1938), *Hoplitis anthocopoides* (Schenck) (Trautmann, 1927) and, as probable host, *Hoplitis villosa* (Schenck) (Petit, 1970) (Megachilidae).
Comment: We are confident in *Chrysis ruddii* using *Ancistrocerus oviventris* as host. We also consider the use of *Ancistrocerus scoticus* as plausible, as this species has a very similar nesting biology. We consider all other host associations unreliable.

Chrysis rutiliventris
Hosts: Unknown.
Comment: A report of *Chrysis rutiliventris* using species of the genus *Ancistrocerus* Wesmael (Vespidae: Eumeninae) as hosts (Morgan, 1984) must be attributed to *Chrysis vanlithi* Linsenmaier (Paukkunen *et al*., 2015).

Chrysis schencki
Reported hosts: *Ancistrocerus trifasciatus* (Müller) (Vespidae: Eumeninae) (Pärn *et al*., 2015; Paukkunen *et al*., 2015). Also reported are *Ancistrocerus gazella* (Panzer) and *Ancistrocerus nigricornis* (Curtis) (Schneider, 1991) (Vespidae: Eumeninae).

Comment: We deem it very unlikely that *Ancistrocerus nigricornis* serves as host of this species, as its biology significantly differs from that of other species in the genus *Ancistrocerus* (*i.e.*, inseminated females overwinter and build their nest in the subsequent year, which would require *Chrysis schencki* to also overwinter). It is very likely that the record actually refers to *Chrysis terminata*.

Chrysis scutellaris

Reported hosts: *Halictus maculatus* Smith (Halictidae) (Berland & Bernard, 1938), *Anthidium oblongatum* Illiger (Megachilidae: Megachilinae) (O. Niehuis, personal observations), *Megachile leachella* Curtis (Megachilidae: Megachilinae) (Sörensson *et al.*, 2012; A. Berg, personal observations). Schmid-Egger *et al*. (1995) speculated that *Anthidium scapulare* Latreille could serve as host, which appears unlikely to us due to different habitat preferences of *Anthidium scapulare* and *Chrysis scutellaris* (S. Tischendorf, personal observations).

Comment: We repeatedly collected *Chrysis scutellaris* together with *Anthidium oblongatum*. The use of *Halictus maculatus* as host appears implausible due to size differences and because there are no other credible reports of cuckoo wasps using halictid bees as hosts.

Chrysis semicincta

Hosts: Unknown.

Comment: The host association with *Osmia rufohirta* Latreille reported by Ducke (1898) very likely refers to *Chrysis jucunda* Mocsáry, as *Chrysis semicincta* does not occur at the places that Ducke (*l.c.*) mentions. Please note that *Chrysis semicincta* and *Chrysis jucunda* share a similar habitus and coloration, yet they belong to two distinct species groups (Linsenmaier, 1959). *Chrysis semicincta* is distributed in West Mediterranean countries and its eastern distribution is limited to North-West Italy (Liguria) and South-West Switzerland, based on historical data (Linsenmaier, 1959, 1997). *Chrysis jucunda* is distributed in South-East Mediterranean countries and its western distributional limit is the Italian Karst Friuli-Venezia Giulia, where it can be locally abundant.

Chrysis sexdentata

Reported hosts: *Euodynerus dantici* (Rossi) (Martynova & Fateryga, 2015), *Ancistrocerus parietum* (Linnaeus) (Berland & Bernard, 1938; Balthasar, 1954) (Vespidae: Eumeninae), *Hoplitis adunca* (Panzer) (Trautmann, 1927), *Megachile sicula* (Rossi) (Invrea, 1941), *Osmia brevicornis* (Fabricius) (Trautmann, 1927; Berland & Bernard, 1938), *Osmia caerulescens* (Linnaeus) (Trautmann, 1927) (Megachilidae: Megachilinae).

Comment: We consider the use of vespid wasps as hosts far more reasonable than the use of megachilid bees, given that the species clusters in a clade that seem to exclusively make use of vespid wasps, a host group also reported in a recent publication (Martynova & Fateryga, 2015).

Chrysis solida

Reported hosts: *Ancistrocerus trifasciatus* (Müller) (Steckel *et al.*, 2014; Pärn *et al*., 2015), *Euodynerus notatus* (Jurine) (Pärn *et al*., 2015), *Euodynerus quadrifasciatus* (Fabricius) (Steckel *et al*., 2014), possibly also *Symmorphus debilitatus* (de Saussure) (Pärn *et al*., 2015) (Vespidae: Eumeninae).

***Chrysis* sp. 2–4**

Hosts: Unknown.

Chrysis splendidula

Reported hosts: *Eumenes coarctatus* (Linnaeus) (Martynova & Fateryga, 2015), *Eumenes mediterraneus* Kriechbaumer and *Eumenes pomiformis* (Fabricius) (Ferton, 1910; Martynova & Fateryga, 2015) (Vespidae: Eumeninae). Also reported are *Gymnomerus laevipes* (Shuckard) and

Symmorphus allobrogus (de Saussure) (Martynova and Fateryga, 2015) (Vespidae: Eumeninae) as well as Crabronidae and Megachilidae (*Anthidium* Fabricius, *Osmia* Panzer) (Linsenmaier, 1969).
Comment: We consider the reported association with Crabronidae and Megachilidae as unreliable, since the species clusters in a group whose members are not known to parasizie bees. A confirmation of hosts other than *Eumenes* is desirable.

Chrysis syriaca
Reported hosts: *Megachile sicula* (Rossi) (Megachilidae: Megachilinae) (Linsenmaier, 1969).

Chrysis terminata
Reported hosts: *Ancistrocerus nigricornis* (Curtis) (Vespidae: Eumeninae) (van Lith, 1954; Linsenmaier, 1959; Paukkunen *et al*., 2015; S. Hopfenmüller, unpublished data; O. Niehuis, unpublished data).

Chrysis tingitana
Reported hosts: of the genus *Ceramius* Latreille (Vespidae: Eumeninae) (Linsenmaier, 1968)

Chrysis tristicula
Reported hosts: *Euodynerus dantici* (Rossi) (Vespidae: Eumeninae) (Gayubo *et al.*, 1987).
Comment: A confirmation of the reported host association is desirable. Since all closely related species are thought to parasitize crabronid wasps as host, we consider the reported host association as questionable and do not consider it in our study.

Chrysis varidens
Hosts: Unknown.

Chrysis viridula
Reported hosts: *Odynerus alpinus* (Schulthess) (Linsenmaier, 1959), *Odynerus melanocephalus* (Gmelin) (Morgan, 1984), *Odynerus reniformis* (Gmelin) (Berland & Bernard, 1938), *Ancistrocerus parietum* (de Bormans, 1887; Trautmann, 1927) *Odynerus spinipes* (Linnaeus) (Chapman, 1869; Adlerz, 1910; Morgan, 1984; Schneider, 1986) (Vespidae: Eumeninae), *Trypoxylon figulus* (Linnaeus) and *Diodontus minutus* Fabricius (Doronin, 1996) (Crabronidae), *Osmia ferruginea* Latreille (Trautmann, 1927), *Osmia inermis* (Zetterstedt) (Berland & Bernard, 1938) (Megachilidae: Megachilinae).
Comment: We are confident in *Odynerus spinipes* serving as host of this species. We consider the reported association with Crabronidae and Megachilidae as unreliable, since the species clusters in a group whose members are not known to parasitize bees.

Chrysis viridissima
Hosts: Unknown.

Chrysis zobeida
Hosts: Unknown.

Chrysura austriaca
Reported hosts: *Hoplitis adunca* (Panzer) (Frey-Gessner, 1887; Trautmann & Trautmann, 1919; Trautmann, 1927; Berland & Bernard, 1938; Linsenmaier, 1959; Mingo *et al*., 1990; Saure, 1998), *Hoplitis anthocopoides* (Schenck) (Berland & Bernard, 1938; Trautmann, 1927; Haupt, 1957), *Hoplitis tuberculata* (Nylander) and *Hoplitis uncinata* Gerstaecker (Kofler, 1975), *Osmia parietina* Curtis (Mocsáry, 1889; Trautmann, 1927), *Osmia bicolor* (Schrank), *Osmia caerulescens* (Linnaeus), *Osmia gallarum* Spinola, *Osmia nigriventris* (Zetterstedt), *Osmia rufa* (Linnaeus),

Osmia ventralis (Panzer) (Kofler, 1975) (Megachilidae: Megachilinae). Also reported are *Ancistrocerus dusmetiolus* (Strand) (Garcia Mercet, 1911) and *Symmorphus crassicornis* (Panzer) (Lamprecht, 1881; Trautmann, 1927; Mingo *et al*., 1990).

Comment: We are confident that *Hoplitis adunca* serves as host based on numerous observations where these two species occur in sympatry and have been collected side by side at nest sites of *Hoplitis adunca*. Further evidence for *Chrysura austriaca* additionally using other bees as hosts is desirable. We consider the use of vespid wasps as hosts as implausible.

Chrysura cuprea

Reported hosts: *Osmia rufohirta* Latreille (du Buysson, 1894; Ducke, 1898; Berland & Bernard, 1938; Heinrich, 1964; Bellmann, 1981), *Osmia andrenoides* Spinola, *Osmia versicolor* Latreille (du Buysson, 1894), *Osmia aurulenta* (Panzer), *Osmia bicolor* (Schrank), (Berland & Bernard, 1938), *Osmia spinulosa* (Kirby) (Trautmann & Trautmann, 1919) (Megachilidae: Megachilinae).

Chrysura dichroa

Reported hosts: *Osmia rufohirta* (Latreille) (du Buysson, 1894; Ferton, 1899, 1905; Malyshev, 1968), *Osmia caerulescens* (Linnaeus) (Ferton, 1905; Grandi, 1961; Heinrich, 1964), *Osmia aurulenta* (Panzer), *Osmia versicolor* Latreille (Banaszak, 1980), *Osmia andrenoides* Spinola, *Osmia spinulosa* (Kirby) (Heinrich, 1964), *Osmia ferruginea* Latreille (Grandi, 1958) (Megachilidae: Megachilinae).

Chrysura hirsuta

Reported hosts: *Hoplitis tuberculata* (Nylander) (Trautmann, 1918), *Hoplosmia spinulosa* (Kirby) (Paukkunen *et al*., 2015), *Osmia brevicornis* (Fabricius) (Trautmann, 1927), *Osmia inermis* (Zetterstedt) (Morgan, 1984), *Osmia nigriventris* (Zetterstedt) (Trautmann, 1927), *Osmia parietina* Curtis (Paukkunen *et al*., 2015), *Osmia pilicornis* Smith (Prosi *et al*., 2016), *Osmia unicincta* Gerstaecker (Paukkunen *et al*., 2015), *Osmia xanthomelana* (Kirby) (Smith, 1862; Trautmann, 1918, 1927; Paukkunen *et al*., 2015) (Megachilidae: Megachilinae).

Chrysura hybrida

Reported hosts: *Hoplitis anthocopoides* (Schenck) (Trautmann, 1927; Theunert, 2006), *Hoplitis fertoni* (Pérez) (Le Goff, 2003), probably *Hoplitis villosa* (Schenck) (Petit, 1970), probably *Osmia caerulescens* Linnaeus, *Osmia morawitzi* Pérez, *Osmia versicolor* Latreille, *Osmia viridana* Morawitz (du Buysson, 1894) (Megachilidae: Megachilinae). Also reported is *Bembix bidentata* Van der Linden (Bembicidae) (Tormos *et al.*, 2009).

Comment: The use of species other than those of the genus *Hoplitis* should be reassessed.

Chrysura laevigata

Reported hosts: *Osmia caerulescens* (Linnaeus) (Megachilidae: Megachilinae) (Martynova, 2014).

Chrysura purpureifrons

Reported hosts: Possibly *Eucera velutina* Morawitz (Apidae: Apinae) (du Buysson, 1894).

Comment: Host information considered unreliable by us.

Chrysura radians

Reported hosts: *Hoplitis adunca* (Panzer) (Frey-Gessner, 1887; Trautmann, 1927; Stöckhert, 1933), *Hoplitis anthocopoides* (Schenck) (Frey-Gessner, 1887; Trautmann, 1927), *Osmia caerulescens* (Linnaeus) (Trautmann, 1927; Strumia, 1997), *Osmia latreillei* (Spinola) (Krombein, 1969), *Osmia leaiana* (Kirby) (du Buysson, 1894; Morgan, 1984; Steckel *et al.*, 2014), *Osmia melanogaster* Spinola (du Buysson, 1894), *Osmia niveata* (Fabricius) (Asensio & Gallego, 1985; Mingo & Gayubo, 1987; Strumia, 1997) (Megachilidae: Megachilinae). Also reported are *Megachile*

parietina (Geoffroy) (Berland & Bernard, 1938; Linsenmaier, 1959) (Megachilidae: Megachilinae).
Comment: Based on our own field observations, we consider reports of species of the genus *Osmia* serving as hosts as reliable.

Chrysura rufiventris
Reported hosts: *Osmia aurulenta* (Panzer) (du Buysson, 1894; Invrea, 1920; Berland & Bernard, 1938), *Osmia bicornis (Linnaeus)* (Berland & Bernard, 1938) (Megachilidae: Megachilinae).
Comment: We consider the host information regarding *Osmia bicornis* as unreliable.

Chrysura simplex
Reported hosts: *Hoplitis anthocopoides* (Schenck) (Trautmann & Trautmann, 1919), *Hoplitis adunca* (Panzer) group (Maneval, 1937), *Osmia cornuta* (Latreille) (Trautmann, 1927; Mingo *et al*., 1990), possibly *Osmia mustelina* Gerstaecker (Saure & Durrenfeld, 1995), *Megachile parietina* (Geoffroy) (De Stefani, 1888) (Megachilidae: Megachilinae).
Comment: *Osmia cornuta* almost certainly does not serve as host, as the species has a different flight period and has been intensively studied with the aid of trap nests without ever being reported as host of *Chrysura simplex*.

Chrysurissa densa
Reported hosts: *Pseudomasaris vespoides* (Cresson), *Pseudomasaris edwardsii* (Cresson) (Hicks, 1929), *Pseudomasaris zonalis* (Cresson) (Parker, 1967), *Pseudomasaris occidentalis* (Cresson) (Hungerford, 1937) (Vespidae: Masarinae).

Euchroeus doursi
Hosts: Unknown.

Euchroeus limbatus
Hosts: Unknown.

Euchroeus oculatissimus
Hosts: Unknown.

Euchroeus purpuratus
Reported hosts: Possibly *Podalonia hirsuta* (Scopoli) (Molitor, 1935; Linsenmaier, 1968), *Podalonia caucasica* (Mocsáry) (Tsuneki, 1947; Linsenmaier, 1968) (Sphecidae).
Comment: Observations confirming the use of specid wasps as hosts are desirable.

***Exochrysis* sp.**
Reported hosts: *Podium* Fabricius (Sphecidae: Sceliphrinae) was recorded for *Exochrysis alabamensis* (Mocsáry) (Krombein, 1958, 1967).

Gaullea argentina
Hosts: Unknown.

Ipsiura pilifrons
Hosts: Unknown.
Comment: see *Ipsiura* sp.

***Ipsiura* sp.**
Reported hosts: *Trypoxylon agamemnon* (Richards) and *Trypoxylon lactitarse* (de Saussure) (Crabronidae) have been reported as hosts of *Ipsiura myops* (du Buysson) (Lucena *et al*., 2016).

Trypoxylon Latreille (Crabronidae) has been reported as host genus of *Ipsiura covillei* Bohart and *Ipsiura genbergi* (Dahlbom) (Lucena *et al*., 2016). *Ancistrocerus flavomarginatus* (Brethes) has been reported as host of *Ipsiura lilloi* Bohart (Lucena *et al*., 2016) and *Eumenes* Latreille has been reported as host genus of *Ipsiura prolixa* Bohart (Lucena *et al*., 2016) (Vespidae: Eumeninae).

Pentachrysis seminigra
Hosts: Unknown.

cf. *Pleurochrysis* sp.
Hosts: Unknown.

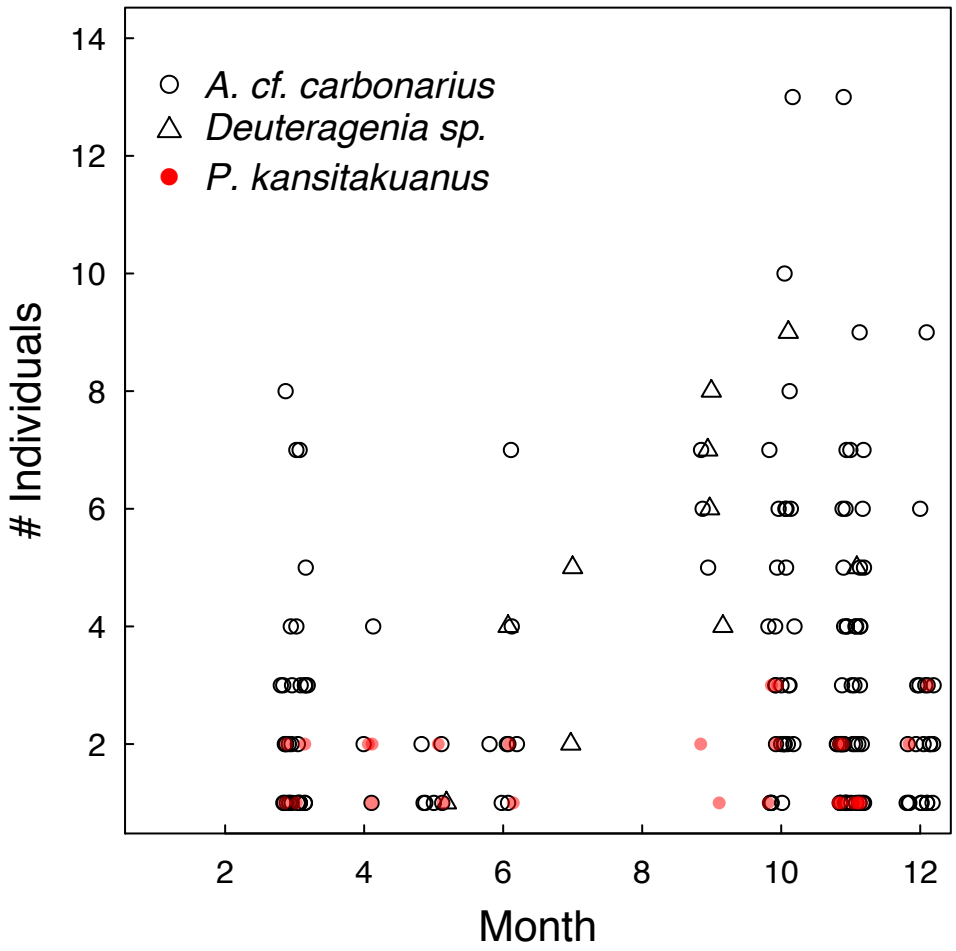
Praestochrysis megerlei
Reported hosts: *Apoda limacodes* (Hufnagel) (Lepidoptera: Limacodidae) (Rosa, 2006).

***Praestochrysis* sp.**
Hosts: Unknown.

Primeuchroeus ellipticus
Hosts: Unknown.
Comment: 42 individuals of the closely related *Primeuchroeus kansitakuanus* (Tsuneki) were reared from 856 larvae of *Auplopus* cf. *carbonarius* (Scopoli) (Pompilidae) and four individuals of two nests of *Primeuchroeus kansitakuanus* were reared from 84 larvae of a species of the genus *Deuteragenia* Šustera (Pompilidae), collected near Xingangshan, Jiangxi Province, China (N29.085833°, E117.929722°), between September and December 2014 and between March and July 2015 (F. Fornoff, personal observations). The phenologies of both observed host species and *Primeuchroeus kansitakuanus* are shown in Supplementary Fig. S6.

Pseudochrysis gratiosa
Hosts: Unknown.

Pseudochrysis neglecta
Reported hosts: *Odynerus spinipes* (Linnaeus) (Smith, 1862; Chapman, 1869; Adlerz, 1910; Linsenmaier, 1959; Morgan, 1984), *Odynerus reniformis* (Gmelin) (Trautmann, 1927; Berland & Bernard, 1938; Linsenmaier, 1959) (Vespidae: Eumeninae). Also reported are *Ancistrocerus parietum* (Linnaeus) (Dahlbom, 1854) and *Gymnomerus laevipes* (Shuckard) (Berland & Bernard, 1938) (Vespidae: Eumeninae). Additionally, there are reports of megachilid bees of the genera *Osmia* Panzer and *Heriades* Spinola (Megachilidae: Megachilinae), which were considered doubtful by Kunz (1994). However, Maneval (1932) described the larva of *Pseudochrysis neglecta* feeding on *Osmia villosa* (Schenck), providing a detailed drawing, and based the identification of *Pseudochrysis neglecta* on the specimen reared from this larva.
Comment: The use of *Odynerus spinipes* as host is clearly established. The use of *Odynerus reniformis* and other eumenine wasps as hosts should be reinvestigated, given the striking chemical adaptation of *Pseudochrysis neglecta* on *Odynerus spinipes* (Wurdack *et al*., 2016). The observation by Maneval (1932) is puzzling if his species identification is correct. Given that species of the *Chrysura radians* group can and have been misidentified as *Pseudochrysis* in the past (O. Niehuis, personal observations), we consider a misidentification the most likely explanation for this striking observation.



Supplementary Figure S6: Phenology of *Auplopus* cf. *carbonarius*, *Deuteragenia* sp., and the cuckoo wasp *Primeuchroeus kansitakuanus*. Host nest cells (empty points & triangles, respectively) and parasitoid larva (red filled points) found in trap nests showed synchronized phenology. All Hymenoptera nests were monthly sampled from trap nests exposed from August 2014 to July 2015 at the BEF-China field sites. In total 176 trap nests were installed, two within each of 88 plots, 40 plots on BEF-China experimental field site A and 48 on BEF-China experimental field site B. Data points shown represent the number of individuals (nest cells) found within one trap nest per collection month, host numbers include parasitized cells. For plotting we added random noise along the x-axis and used transparent colours, to show superimposing data points.

Pseudochrysis schmiedeknechti
Hosts: Unknown.

Spinolia insignis
Hosts: Unknown.

Spinolia lamprosoma
Reported hosts: *Paragymnomerus spiricornis* (Spinola) (Vespidae: Eumeninae) (Rosa, 2006).

Spinolia theresae
Reported hosts: *Euodynerus variegatus* (Fabricius) (Vespidae: Eumeninae) (Morice, 1909).

Spintharina mocsaryi
Hosts: Unknown.

Spintharina* cf. *basiliana
Hosts: Unknown.

Spintharina versicolor
Reported hosts: *Celonites abbreviatus* (Villers) (Linsenmaier, 1997), *Celonites apiformis* Fabricius (Trautmann, 1927) (Vespidae: Masarinae).

Stilbum calens
Reported hosts: *Katamenes arbustorum* (Panzer) (Fabre, 1924), *Katamenes flavigularis* (Blüthgen) (Martynova & Fateryga, 2015) (Vespidae: Eumeninae), *Sceliphron madraspatanum tubifex* (Latreille) (Sphecidae) (du Buysson, 1896), *Megachile parietina* (Geoffroy) (Megachilidae: Megachilinae) (Lichtenstein, 1873; Lepri, 1910; Invrea, 1921).
Comment: Confirmation of megachilid bees and sphecid wasps indeed serving as hosts is desirable.

Stilbum cyanurum
Reported hosts: *Sceliphron caementarium* (Drury) (Campadelli *et al*., 1999; Matteini Palmerini *et al*., 2014), *Sceliphron destillatorium* Illiger (De Stefani, 1888; Lichtenstein, 1873; Móczár, 1961; Mingo *et al*., 1990) (Sphecidae), *Katamenes arbustorum* (Panzer), *Delta emarginatum* (Linnaeus) (Mingo *et al*., 1990), *Delta unguiculatum* (Villers) (Invrea, 1921; Grandi, 1961) (Vespidae: Eumeninae), *Megachile sicula* (Rossi) (Tournier, 1878; Mocsáry, 1912), *Megachile fraterna* Smith and *Megachile monticola* Smith (Bingham, 1903; Mocsáry, 1912) (Megachilidae: Megachilinae).
Comment: Confirmation of megachilid bees and vespid wasps serving as hosts is desirable.

Trichrysis cyanea
Reported hosts: *Trypoxylon attenuatum* Smith (Danks, 1970; Morgan, 1984; Jacobs & Oehlke, 1990; Asís *et al*., 1994; Strumia, 1997), *Trypoxylon beaumonti* Antropov (Asís *et al*., 1994), *Trypoxylon clavicerum* Lepeletier & Serville (Westrich, 1979), *Trypoxylon figulus* (Linnaeus) (Dufour & Perris, 1840; Alfken, 1915; Haverhorst, 1916; Trautmann, 1927; Danks, 1970; de Groot, 1971; Morgan, 1984; Asís *et al*., 1994; Kunz, 1994; S. Hopfenmüller, unpublished data), *Trypoxylon medium* Beaumont (S. Hopfenmüller, unpublished data), *Trypoxylon scutatum* Chevrier (Garcia Mercet, 1911), *Pison atrum* (Spinola) (Grandi, 1936) (Crabronidae), *Psenulus pallipes* (Panzer) (Psenidae) and *Pemphredon lethifer* (Shuckard) (Pemphredonidae) (Tormos *et al*., 1996), *Passaloecus eremita* Kohl (Lomholdt, 1975–1976; Jacobs & Oehlke, 1990), *Passaloecus gracilis* (Curtis) (Jacobs & Oehlke, 1990) (Pemphredonidae), *Ectemnius rubicola* (Dufour & Perris) (Enslin, 1921; Kunz, 1994), possibly *Nitela spinolae* Latreille (Crabronidae) (Berland & Bernard, 1938) and *Stigmus pendulus* Panzer (Pemphredonidae) (Hoffer, 1963) (Crabronidae), *Auplopus carbonarius* (Scopoli) (Theunert, 1997) and *Deuteragenia bifasciata* (Geoffroy) (Wolf, 1971; Pärn *et al*., 2015; Paukkunen *et al*., 2015) (Pompilidae). The literature includes additional possible hosts: *Ancistrocerus parietum* (Linnaeus) (Vespidae: Eumeninae) (Trautmann & Trautmann, 1919), *Chelostoma florisomne* (Linnaeus) (Smith, 1862; Berland & Bernard, 1932), *Heriades* Spinola (Berland & Bernard, 1938), *Osmia* Panzer (Dufour & Perris, 1840), *Osmia inermis* Zetterstedt (Doronin, 1996), *Osmia caerulescens* (Linnaeus) and *Osmia giraudi* Gerstaecker (Frey-Gessner, 1890) (Megachilidae: Megachilinae).
Comment: We consider the use of crabronid wasps of the genus *Trypoxylon* and of pompilid wasps of the genera *Auplopus* and *Deuteragenia* as now clearly recorded. However, *Trichrysis cyanea* might at least occasionally parasitize also other crabronid wasps that do not prey on spiders, but additional research that can rule out alternative explanations (*e.g.*, superposition of nests) is desirable.

***Trichrysis* sp.**
Hosts: Unkown.

Tribe Elampini

Elampus bidens
Reported hosts: Possibly *Passaloecus* (Pemphredonidae) (Saure, 2012).
Comment: Information is based on observations of *Elampus bidens* entering *Passaloceus* nests.

Elampus foveatus
Hosts: Unknown.

Elampus panzeri
Reported hosts: *Mimesa bicolor* (Jurine) (Trautmann, 1927), *Mimesa equestris* (Fabricius) (Morice, 1903; Benno, 1950), possibly also *Mimesa lutaria* (Fabricius) (Morice, 1903) (Psenidae).

***Exallopyga* sp.**
Hosts: Unknown.

Hedychridium anale
Hosts: Unknown.

Hedychridium ardens
Reported hosts: *Oxybelus bipunctatus* Olivier (van der Smissen, 2001) and *Oxybelus haemorroidalis* Olivier (Trautmann, 1927), *Tachysphex nitidus* (Spinola) (Trautmann, 1927; Benno, 1950), *Tachysphex obscuripennis* (Schenck) (Kofler, 1975), *Tachysphex pompiliformis* (Panzer) (Else, 1973; Morgan, 1984) (Crabronidae). Possibly also *Diodontus tristis* (Van der Linden) (Berland & Bernard, 1938) (Pemphredonidae).
Comment: Based on our own field observations, we consider species of the genus *Tachysphex* to be used as hosts. It would be desirable to confirm the use of *Diodontus tristis* and *Oxybelus bipunctatus* as hosts. We consider reported host associations with *Halictus* Latreille (Halictidae) (Trautmann, 1927) and *Odynerus* Latreille (Vespidae: Eumeninae) (Berland & Bernard, 1938) as not credible.

Hedychridium caputaureum
Reported hosts: *Astata minor* (Kohl) (Astatidae) (Linsenmaier, 1968; Saure, 1998; Paukkunen *et al.*, 2015).

Hedychridium coriaceum
Reported hosts: *Lindenius albilabris* (Fabricius) (Crabronidae) (Arnold, 1908, 1910; Mortimer, 1913; Morgan, 1984; Tischendorf, 1998). Also reported are *Oxybelus uniglumis* (Linnaeus) (Alfken, 1915) and *Tachysphex panzeri* (Van der Linden) (Jacobs & Oehlke, 1990) (Crabronidae).
Comment: Based on our own field observations, we consider the use of *Oxybelus uniglumis* and *Tachysphex panzeri* as hosts as unlikely.

Hedychridium cupratum
Hosts: Unknown.
Comment: Two host associations have been reported, *Ancistrocerus oviventris* (Wesmael) (Vespidae: Eumeninae) (Invrea, 1941) and *Harpactus lunatus* (Dahlbom) (Crabronidae) (Berland & Bernard, 1938). The use of *Ancistrocerus oviventris* as host appears implausible due to the size differences compared to *Hedychridium cupratum* and because closely related species exclusive use Astatidae and Crabronidae as hosts. The report of *Harpactus lunatus* is erroneously taken from Trautmann & Trautmann (1919), who reported *Harpactus lunatus* as host of *Hedychridium integrum* (Dahlbom), which likely referred to the species *Hedychridium cupreum*.

Hedychridium cupreum
Reported hosts: *Dryudella pinguis* (Dahlbom) (Else, 1973; Schmid-Egger *et al*., 1995; Saure *et al*., 1998) and *Dryudella stigma* (Panzer) (Morgan, 1984) (Astatidae). Also reported is *Harpactus tumidus* (Panzer) (Bembicidae) (Lefeber, 1986; Banaszak, 1980).
Comment: Based on our own field observations, we consider the use of *Harpactus tumidus* as hosts as unlikely.

Hedychridium elegantulum
Reported hosts: *Dinetus pictus* (Fabricius) (Crabronidae) (Heinrich, 1964; Tormos *et al.*, 1997).

Hedychridium femoratum
Reported hosts: *Dryudella stigma* (Panzer) (Astatidae) (Lefeber, 1986; Schmid-Egger, 1995; Saure *et al*., 1998).

Hedychridium flavipes
Hosts: Unknown.

Hedychridium incrassatum
Reported hosts: *Halictus* Latreille (Halictidae) (du Buysson, 1892; Mingo, 1994).
Comment: Given that there is no reliable report of any cuckoo wasp species making us of halictid bees as host, we have doubts in the reported host association.

Hedychridium krajniki
Reported hosts: *Lindenius pygmaeus armatus* (Van der Linden) (Crabronidae) (Schnee, 1997; Tischendorf, 1998).

Hedychridium monochroum
Reported hosts: *Solierella compedita* (Piccioli) (Crabronidae) (Grandi, 1961; Martynova, 2017).

Hedychridium planifrons
Hosts: Unknown.

Hedychridium roseum
Reported hosts: *Astata boops* (Schrank) (Astatidae) (Van der Smissen, 2001; Paukkunen *et al*., 2015). Also reported are *Dryudella stigma* (Panzer) (Astatidae) (Saure, 1998), *Tachysphex pompiliformis* (Panzer) (Crabronidae), and *Harpactus tumidus* (Panzer) (Bembicidae) (Shuckard, 1837; Müller, 1918; Forsius, 1925; Doronin, 1996).
Comment: A confirmation of host associations other than the one with *Astata boops* is desirable.

Hedychridium sexdentatum
Hosts: Unknown.

Hedychridium wahisi
Hosts: Unknown.

Hedychrum chalybaeum
Reported hosts: *Cerceris interrupta* (Panzer) (Philanthidae) (Schmid-Egger, 2000; Tischendorf & Treiber, 2003; Reder & Burger, 2009).

Hedychrum gerstaeckeri
Reported hosts: *Cerceris rybyensis* (Linnaeus) (Alfken, 1915; Petit, 1975; Westrich, 1979; Brechtel,

1986; Gayubo *et al*., 1987; Jecobs & Oehlke, 1990; van der Smissen, 2001), *Cerceris ruficornis* (Fabricius) and *Cerceris sabulosa* (Panzer) (Grandi, 1929, 1961) (Philanthidae). Also reported have been *Philanthus coronatus* (Thunberg) (du Buysson, 1893; Gayubo *et al*., 1987) and *Philanthus triangulum* (Farbricius) (Gayubo *et al.*, 1987) (Philanthidae). A recent study (Pereira-Peixoto *et al.*, 2016) reported *Symmorphus* Wesmael as host.

Comment: We consider *Cerceris sabulosa* a likely host of this species, as this species replaces *Cerceris rybyensis* in some places in southern Germany, where we also find *Hedychrum gerstaeckeri*. We doubt that species of the genera *Philanthus* and *Symmorphus* serve as host of *Hedychrum gerstaeckeri*.

Hedychrum longicolle

Reported hosts: *Cerceris bicincta* Klug (Asís *et al*., 1991).

Hedychrum niemelai

Reported hosts: *Cerceris quadrifasciata* (Panzer) (Paukkunen *et al*., 2015) and *Cerceris quinquefasciata* (Rossi) (Morgan, 1984; Paukkunen *et al*., 2015) (Philanthidae). Also reported are *Cerceris arenaria* (Linnaeus), *Cerceris ruficornis* (Fabricius), and *Cerceris rybyensis* (Linnaeus) (Morgan, 1984) (Philanthidae).

Comment: We consider the latter three host associations as uncertain. In particular the reports of *Cerceris arenaria* and *Cerceris rybyensis* very likely are due to misidentifications and refer to *Hedychrum nobile* and *Hedychrum gerstaeckeri*, respectively.

Hedychrum nobile

Reported hosts: *Cerceris arenaria* (Linnaeus) (Philanthidae) (Alfken, 1915; Lomholdt, 1975–1976; Schmid-Egger *et al*., 1995; Saure, 1998; Paukkunen *et al*., 2015). Also reported are *Cerceris quadrifasciata* (Panzer), *Cerceris rybyensis* (Linnaeus) (Aerts, 1950), and *Cerceris ruficornis* (Kunz, 1994) (Philanthinae).

Comment: We consider the reported host associations with *Cerceris quadrifasciata*, *Cerceris rybyensis*, and *Cerceris ruficornis* as uncertain.

Hedychrum rutilans

Reported hosts: *Philanthus triangulum* (Fabricius) (Philanthidae) (Ferton, 1910; Trautmann, 1927; Morgan, 1984; Veenendaal, 1987).

***Holophris* sp. 2**

Hosts: Unknown.

Holophris taiwana

Hosts: Unknown.

Holopyga austrialis

Hosts: Unknown.

Holopyga biskrana

Hosts: Unknown.

Holopyga chrysonota

Reported hosts: *Cerceris quadrifasciata* (Philanthidae) (Molitor, 1935).

Comment: We consider the above host associations are purely speculative. Saure (1998) suspects *Tachysphex* Kohl, in particular *Tachysphex unicolor* (Panzer) and *Tachysphex nitidus* (Spinola) (Crabronidae). Overall, we consider the host of *Holopyga chrysonota* as unknown.

Holopyga fervida
Hosts: Unknown.

Holopyga generosa
Reported hosts: *Astata boops* (Schrank) (Astatidae) (Veenendaal, 2012; Paukkunen *et al*., 2015).

Holopyga ignicollis
Hosts: Unknown.

Omalus aeneus
Reported hosts: *Passaloecus borealis* Dahlbom (Steckel *et al.*, 2014; S. Hopfenmüller, unpublished data), *Passaloecus corniger* Shuckard (Westrich, 1979; Steckel *et al.*, 2014; Pereira-Peixoto *et al.*, 2016), *Passaloecus cuspidatus* Smith (Krombein, 1967), *Passaloecus eremita* Kohl (Lomholdt, 1975–1976; Westrich, 1979; Brechtel, 1986; Steckel *et al.*, 2014; S. Hopfenmüller, unpublished data), *Passaloecus gracilis* (Curtis) (Barbey & Ferrière, 1923; Trautmann, 1927; Benno, 1950; van Lith, 1958; Lomholdt, 1973; Jacobs & Oehlke, 1990), *Passaloecus insignis* (Van der Linden) (Krombein, 1967; Pereira-Peixoto *et al.*, 2016), *Passaloecus lugubris* (Frabricius) (Paukkunnen *et al*., 2015), *Passaloecus singularis* Dahlbom (Grandi, 1961; Paukkunnen *et al*., 2015), *Passaloecus turionum* Dahlbom (Trautmann, 1927; Grandi, 1961; Lomholdt, 1975–1976), *Pemphredon lethifer* (Shuckard) (Spooner, 1954; Westrich, 1979; Jacobs & Oehlke, 1990), *Pemphredon rugifer* (Dahlbom) (Trautmann, 1927; Grandi, 1961), (Pemphredonidae), *Psenulus pallipes* (Panzer) (Psenidae) (Spooner, 1954; Strumia, 1997).

Omalus biaccinctus
Reported hosts: *Passaloecus eremita* Kohl (Wickl, 2001), *Passaloecus gracilis* (Curtis) (Tormos *et al*., 1996), *Passaloecus insignis* (Van der Linden) (Pereira-Peixoto *et al.*, 2016), possibly also *Passaloecus turionum* Dahlbom (Lomholdt, 1975–1976; Jakobs & Oehlke, 1990) (Pemphredonidae).

Omalus puncticollis
Reported hosts: *Passaloecus corniger* Shuckard (Gauss, 1967; Tim Winter, unpublished data), *Passaloecus eremita* Kohl (Pereira-Peixoto *et al.*, 2016; Tim Winter, unpublished data), *Passaloecus gracilis* (Curtis) group (Berland & Bernard, 1938; Spooner, 1954), *Passaloecus insignis* (Van der Linden) (Tim Winters, unpublished data), *Passaloecus turionum* Dahlbom (Mocsáry, 1912), *Spilomena* Shuckard (Pereira-Peixoto *et al.*, 2016) (Pemphredonidae).

***Omalus* sp. 1**
Hosts: Unknown.

Philoctetes bidentulus
Reported hosts: *Psenulus pallipes* (Panzer) (Psenidae) (Mocsáry, 1912; Trautmann, 1927; Lomholdt, 1975–1976; Banaszak, 1980), *Pemphredon* Latreille (Pemphredonidae) (Molitor, 1935). Also reported are species of the genera *Rhopalum* Stephens and *Trypoxylon* Latreille (Molitor, 1935) (Crabronidae).
Comment: A confirmation of the above reported hosts would be desirable. We consider *Trypoxylon* to be very unlikely a host of this species, as the parasitoids of *Trypoxylon* are well known from trap nest studies.

Philoctetes micans
Hosts: Unknown.

Philoctetes putoni
Hosts: Unknown.

Pseudomalus auratus
Reported hosts: *Passaloecus brevilabris* Wolf (Wickl, 2001), *Passaloecus corniger* Shuckard (Westrich, 1979), *Passaloecus eremita* Kohl (Westrich, 1979), *Passaloecus gracilis* (Curtis) (Barbey & Ferrière, 1923; Danks, 1970; Morgan, 1984), *Passaloecus insignis* (Van der Linden) (Van Lith, 1958), *Passaloecus monilicornis* Dahlbom (Wagner, 1937), *Passaloecus pictus* Ribaut (Strumia, 1997), *Passaloecus singularis* Dahlbom (Grandi, 1959; Leclercq, 1940, 1941; Jacobs & Oehlke, 1990), *Passaloecus turionum* Dahlbom (Jacobs & Oehlke, 1990), *Pemphredon austriaca* (Kohl) (Kunz, 1994; Strumia, 1997), *Pemphredon inornata* (Say) (Van Lith, 1958; Morgan, 1984; Jacobs & Oehlke, 1990), *Pemphredon lethifer* (Shuckard) (Leclercq, 1940, 1941; Benno, 1950; Grandi, 1961; Morgan, 1984), *Pemphredon lugens* Dahlbom (Westrich, 1979), *Pemphredon lugubris* (Fabricius) (du Buysson, 1892; Grandi, 1935), *Pemphredon rugifer* (Dahlbom) (Lomholdt, 1975–1976) (Pemphredonidae). Also reported are *Crabro planifrons* (Thomson) (Alfken, 1915; Doronin, 1996), *Diodontus tristis* (Van der Linden) (Pemphredonidae) (Blösch, 2002), *Ectemnius ruficornis* (Zetterstedt) (Strumia, 1997), *Rhopalum clavipes* (Linnaeus) (Jakobs & Oehlke, 1990), *Rhopalum coarctatum* (Scopoli) (Danks, 1970; Morgan, 1984; Strumia, 1997), *Trypoxylon attenuatum* Smith (du Buysson, 1892; Housiaux, 1922; Trautmann, 1927; Jakobs & Oehlke, 1990), *Trypoxylon clavicerum* Lepeletier (Gauss, 1967; Strumia, 1997), *Trypoxylon figulus* (Linnaeus) (Dufour & Perris, 1840; Trautmann, 1927), *Trypoxylon* sp. (Danks, 1970; Morgan, 1984) (Crabronidae), *Psenulus concolor* (Dahlbom) (Leclercq, 1940, 1941; Westrich, 1979; Jakobs & Oehlke, 1990), and *Psenulus fuscipennis* (Dahlbom) (S. Hopfenmüller, unpublished data) (Psenidae).
Comment: As *Pseudomalus auratus* is known to lay its eggs on aphids rather than entering the nest of its hosts (Paukkunnen *et al*., 2015; A. Berg, personal observations), we only consider associations with hosts that hunt aphids credible (*i.e.*, the reported species of the genera *Diodontus*, *Passaloecus*, *Pemphredon*, and *Psenulus*).

Pseudomalus pusillus
Reported hosts: *Passaloecus corniger* Shuckard (Pereira-Peixoto *et al.*, 2016), *Passaloecus eremita* Kohl, *Passaloecus insignis* (Van der Linden) (Wickl, 2001), *Pemphredon lethifer* (Shuckard) (Benno, 1950) (Pemphredonidae). Also reported are *Trypoxylon attenuatum* Smith (du Buysson, 1892; Jacobs & Oehlke, 1990), *Trypoxylon clavicerum* Lepeletier & Serville (Housiaux, 1922, Jacobs & Oehlke, 1990), *Trypoxylon figulus* (Linnaeus) (du Buysson, 1892) (Crabronidae).
Comment: We follow Paukkunen *et al*. (2015) in questioning reported associations with species of the genus *Trypoxylon*, as it appears more plausible to us that *Pseudomalus triangulifer* is (like *Pseudomalus auratus*) specialized on aphid hunting Pemphredonidae.

Pseudomalus triangulifer
Reported hosts: *Passaloecus borealis* Dahlbom (S. Hopfenmüller, unpublished data), *Passaloecus corniger* Shuckard (Tim Winters, unpublished data), *Passaloecus insignis* (Van der Linden) (Veenendal, 2011), *Passaloecus monilicornis* Dahlbom (Wickl, 2001), *Pemphredon lethifer* (Shuckard) (Paukkunen *et al*., 2015)*, Pemphredon lugens* Dahlbom (Wickl, 2001; Veenendal, 2011; S. Hopfenmüller, unpublished data), *Pemphredon rugifer* (Dahlbom) (Strumia, 1996) (Pemphredonidae). Also reported are *Ectemnius ruficornis* (Zetterstedt) (Crabronidae) (Alfken, 1915), *Psenulus concolor* (Dahlbom) (Wickl, 2001), and *Psenulus laevigatus* (Schenck) (Linsenmaier, 1997) (Psenidae).
Comment: It appears plausible to us that *Pseudomalus pusillus* is (like *Pseudomalus auratus*) specialized on aphid hunting Pemphredonidae. We therefore question a host association with

Ectemnius ruficornis and *Psenulus concolor*.

Pseudomalus violaceus
Reported hosts: *Passaloecus corniger* Shuckard (Morgan, 1984; Pereira-Peixoto *et al.*, 2016) and *Pemphredon lugubris* (Fabricius) (Morgan, 1984), *Passaloecus eremita* Kohl (Paukkunen *et al*., 2015). Also reported are *Trypoxylon attenuatum* Smith (du Buysson, 1892; Berland & Bernard, 1938) and *Trypoxylon figulus* (Linnaeus) (Berland & Bernard, 1938).
Comment: We follow Paukkunen *et al*. (2015) in questioning reported associations with species of the genus *Trypoxylon*, as it appears more plausible to us that *Pseudomalus violaceus* is (as *Pseudomalus auratus*) specialized on aphid hunting Pemphredonidae.

Tribe Parnopini

Cephaloparnops denticulatus
Hosts: Unknown.

Cephaloparnops vareillesi
Hosts: Unknown.

Parnopes grandior
Reported hosts: *Bembix bicolor* Radoszkowski and *Bembix cinctella* Handlirsch (Linsenmaier, 1968), *Bembix integra* Panzer (Grandi, 1927; Balthasar, 1946), *Bembix oculata* Latreille and *Bembix olivacea* Fabricius (Grandi, 1927), *Bembix rostrata* (Linnaeus) (Balthasar, 1946; Grandi, 1961; Gauss, 1967; Strumia, 1997), *Bembix sinuata* Panzer (Gayubo *et al*., 1987), *Bembix zonata* Klug (Asís *et al*., 2004, Ballesteros *et al*., 2012) (Bembicidae).

Parnopes unicolor
Hosts: Unknown.

Family Dryinidae

***Anteon* sp.**
Reported: Congeneric species are known to be parasitoids of Cicadellidae (Hemiptera) (Olmi, 1994).

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