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## **TRACHELIODES**

*Brachymerus* Dahlbom, 1845:5 19, junior homonym of *Brachymerus* Chevrolet in Dejean, 1835 (Coleoptera). Type species: *Crabro megerlei* Dahlbom, 1845 [= *Crossocerus curvitorsus* Herrich-Schaeffer, 1841], by monotypy.

*Tracheliodes* A. Morawitz, 1866:249. Type species: *Brachymerus megerlei* (Dahlbom, 1845) [= *Crabro megerlei* Dahlbom, 1845 = *Crossocerus curvitorsus* Herrich-Schaeffer, 1841], designated by Ashmead, 1899d:219.

*Fertonius* Pérez in Ferton, 1892:341. Type species: *Crossocerus luteicollis* Lepeletier de Saint Fargeau and Brullé, 1835 [= *Crabro quinquenotatus* Jurine, 1807], designated by Pate, 1937c:27.

Revisions: Nemkov, 1988b:116 (Holarctic species), Leclercq, 2005a:3 (New World); Le Divelec, 2022 (Mediterranean Basin).

Keys: Fernandez and Amarante, 2004 (Neotropical species); M. Li and Q. Li, 2011:146 (China).

Review of biology: Kazenas, 2001b:1198.

### **1. *alinae* Nemkov**

*Tracheliodes alinae* Nemkov, 1988a:123, ♀. Holotype: ♀, Russia: Primorskiy Krai: Vladivostok (ZIN). – Nemkov, 1988a:119 (in key to Holarctic *Tracheliodes*); Nemkov in Nemkov, Kazenas, Budrys, et Antropov, 1995:441 (in key to Sphecidae of Russian Far East); Nemkov, 2008b:22 (in catalog of Crabronidae of Asiatic Russia), 2009a:65 (is an endemic of Russian Far East), 2009b:111 (in new catalog of Sphecidae and Crabronidae of Asiatic Russia), 2011:95 (in Russian Far East occurring only in Primorskiy Krai), 2012c:445 (in catalog of Crabronidae of Russian Far East); Antropov, 2017b:236 (in catalog of Crabroninae of Russia).

### **2. *amazonicus* Fernández and Amarante**

*Tracheliodes amazonicus* Fernández and Amarante, 2004:2, ♀. Holotype: ♀, Colombia: Amazonas: Amacayau National Park: Mata-Mata creek (Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogota). – Fernández and Amarante, 2004:491 (in key to Neotropical *Tracheliodes*); Leclercq, 2005a:4 (in key to New World *Tracheliodes*), 5 (bibliographic reference); Andrade, Amat, Fernández, and Sarmiento, 2007:42 (holotype deposited in Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogota).

### **3. *amu* Pate**

*Tracheliodes amu* Pate, 1942b:235, ♂. Holotype: ♂, USA: New Mexico: San Miguel County: Pecos (MCZ). – Krombein in Muesebeck, Krombein, and Townes, 1951:1015 (in catalog of North American Hymenoptera); Leclercq, 1954c:243 (in catalog of world Crabronini); Evans, 1964b:290 (description of larva); Krombein, 1967b:257 (nesting habits observed in artificial nests); R. Bohart and Menke, 1976:405 (in checklist of world Sphecidae); Krombein, 1979b:1671 (in catalog of North American Hymenoptera); Nemkov, 1988:119 (in key to Holarctic *Tracheliodes*), 121 (bibliographic reference); Leclercq, 2005a:3 (in key to New World *Tracheliodes*), 4 (locality records, comments about ♂, description of ♀).

### **4. *carnavalus* Leclercq**

*Tracheliodes carnavalus* Leclercq, 1981a:242, ♀, ♂. Holotype: ♀, Brazil: Serra da Bocaina (AEI). – Melo, 2000:89 (use of nest by more than one female); Amarante, 2002:34 (in catalog of Neotropical Crabronidae); Leclercq and Cambra, 2003b:26 (Brazil: Minas Gerais: Viçosa: Montagem do Paraíso), 30 (photographs of male head); Fernández and Amarante, 2004:491 (in key to Neotropical *Tracheliodes*); Leclercq, 2005a:4 (in key to New World *Tracheliodes*), 4 (Brazil: Bahia: Encruzilhada; additional description).

### 5. *colomai* Leclercq

*Tracheliodes colomai* Leclercq, 2005a:5, ♀. Holotype: ♀, Ecuador: Monona Santiago (M. Cooper coll., London). – Leclercq, 2005a:4 (in key to New World *Tracheliodes*).

### 6. *curvitarisus* (Herrich-Schaeffer)

*Crossocerus curvitarisus* Herrich-Schaeffer, 1841:51, pl. 19, ♀. Holotype or syntypes: ♀, Germany: no specific locality (lost). – A. Morawitz, 1866:250 (in revision of Crabronini, may be identical to *Brachymerus megerlei*); Pádr in Šedivy, 1989:170 (in checklist of Czechoslovakian Sphecidae); Vepřek, 2000:236 (recorded from Czech Republic: Mlýňany, by Bouček, 1957, as *curvitarisus*). – **As *Crabro curvitarisus* [sic]**: Emery, 1891:173 (new generic assignment, preying on ant *Liometopum microcephalum* Panzer, Italy: Portici and Bologna); Kohl, 1893a:23 (Austria: Niederösterreich: Wien: Türkenschanze, as *curvitarisus*); Dalla Torre, 1897:595 (in catalog of world Sphecidae); W. Schulz, 1904b:98 (Germany: Nassau); Kohl, 1915:326 (in revision of Palearctic Crabronini); Schmiedeknecht, 1930:659 (in keys to Hymenoptera of North and Central Europe); Zavadil in Zavadil and Šnoflak, 1948:123 (in key to Sphecidae of Czechoslovakia, not yet found in Czechoslovakia); Noskiewicz and Puławski, 1960:155 (in key to Polish Sphecidae, not yet found in Poland); Balthasar, 1972:93 (in Sphecid Fauna of Czechoslovakia, not yet found in country). – **As *Brachymerus curvitarisus* [sic]**: Emery, 1893:LXIII (new generic assignment, Italy: Napoli and Bologna areas, nesting habits); Ashmead, 1899:219 (type species of genus *Brachymerus*); Adlerz, 1904:136 (known prey: *Liometopum microcephalum*); Piek and Spanjer, 1986:181 (in list of Sphecidae with known prey, as *Brachymeris*). – **As *Tracheliodes curvitarisus* [sic]**: Bequaert, 1922:283 (new generic assignment, known prey and nesting habits described); Leclercq, 1954c:243 (in catalog of world Crabronini); Móczár, 1958a:265 (in annotated catalog of Hungarian Crabronini), 1958b:199 (Hungary: list of collecting localities); de Beaumont, 1959a:43 (Italy: Sicilia); Wolf, 1959b:34 (Germany: Nassau); de Beaumont, 1965a:60 (Greece); R. Bohart and Menke, 1976:405 (in checklist of world Sphecidae); Pulawski, 1978:265 (in key to Sphecidae of European part of USSR); Dollfuss, 1983a:75 (endangered in Niederösterreich, Austria), 1983b:17 (in catalog of Sphecidae of Austria: Türkenschanze in Wien); Tyner, 1987:232 (Czechoslovakia: Moravy); Nemkov, 1988:119 (in key to Holarctic *Tracheliodes*), 1211 (bibliographic reference); Pagliano, 1990:94 (in catalogue of Italian Sphecidae); Day, 1991:xix (summary of European Endangered Hymenoptera Lists); Dollfuss, 1991:160 (in key to Sphecidae of North and Central Europe); Pagliano, 1991b:358 (in key to Italian Crabroninae); Dollfuss, 1994:98 (endangered in Austria); Negrisolino in Minelli, Ruffo, and La Posta, 1995b:8 (in catalog of Italian fauna); Schmidt and Schmid-Egger, 1997:28 (Kohl's, 1915, record from Nassau in Germany is questionable); Vicidomini, 2000b:28 (Italy: previously recorded from Campania); Józán, 2001:280 (Hungary: Somogy County); Ohl et al., 2001:142 (recorded from Germany but not occurring there); Zettel, Gross, and Mazzucco, 2001:77 (Austria: Wien); Lukáš and Liška, 2005:550 (first record from Slovakia: Šúr); Pagliano and Negrisolino, 2005:299 (in Sphecid Fauna of Italy); Straka, 2005a:399 (critically endangered in Czech Republic, as *curvitarisus*); Józán, 2006:285 (Hungary: Barcs); Vepřek, Mihal, and Klváček, 2006:221 (recognition characters, prey; in Czech); Vepřek and Straka, 2007:207 (in catalog of Sphecidae of Czech Republic and Slovakia), 231 (Moravia: Břeclav, Ladná, Lednice, Slovakia: Tesárske Mlýňany, Vieska on Žitava River); U. Frommer, 2009a:29 (Germany: in checklist of Sphecidae of Hessen, as questionable species), 41 (does not occur in Germany); Frommer and Tischendorf, 2009:14 (the species does not occur in Germany: it was not recorded from Nassau bei Schenck, 1861, and the record by Schulz, 1904 is erroneous; its prey, ant *Liometopum microcephalum* Mayr, does not occur in Germany); Józán, 2011:182 (in checklist of Sphecidae *sensu lato* of Hungary). – **As *Tracheliodes curvitarisus***: Scobiola-Palade, 1968a:822 (first record from Romania: Ilfov District: Snagov); Bitsch and Leclercq, 1993:229 (in revision of western European Crabroninae); Leclercq, 1993c:42 (study of specimens examined by Kohl); Dollfuss, 2004b:783 (Bulgaria, Czech Republic, Greece); Zettel et al., 2004:45 (Austria, Czech Republic, Bulgaria, Greece, redescription, occurring in the same localities as *Tracheliodes varus* and using same prey: ant *Liometopum microcephalum* (Panzer)); Jacobs, 2007:143 (in key to Crabronidae of Germany); Bitsch and Leclercq, 2009:226 (in supplement to vol. I of Faune de France, 1993: reference to Zettel et al.,

2004; recently recorded from Austria, Bulgaria, Czech Republic, and Greece); U. Frommer, 2010:12 (*curvitorsus* is correct spelling, nomenclatural history); Tischendorf, Frommer, Flügel et al., 2011:186 (Germany: the record from Hessen (as Nassau) by Schulz, 1904 is wrong); Bitsch, 2014:402 (reference to U. Frommer, 2010); Mei, 2016:16 (Italy: Umbria: Città di Castello; Lazio: Manziana and Nettuno); Bitsch and Leclercq *in* Bitsch, Antropov, Gayubo, Leclercq, Schmid-Egger, K. Schmidt, and Straka, 2021:154 (in revision of Sphecidae *sensu lato* of Europe).

*Crabro megerlei* Dahlbom, 1845:519, 525, ♀ (as *Megerlei*, incorrect original capitalization). Holotype or syntypes: ♀, Austria: Wien (Lund). Synonymized with *Crabro curvitorsus* by Kohl, 1893a:23. – Schenck, 1861:157 (description, Austria: Wien); Taschenberg, 1866:174 (in revision of Hymenoptera of Germany); Kirchner, 1867:224 (in catalog of European Hymenoptera); Schenck, 1867a:351 (known from Germany); Kohl, 1897:482 (illustration of wings). – **As *Brachymerus megerlei***: Taschenberg, 1858:108 (new generic assignment, Germany); Wierzejski, 1874:261 (Ukraine: Podole Region: Janów).

*Crabro filigranus* A. Costa, 1864b:98, 1964d:137, and 1867c:130♀. Holotype: ♀, Italy: Emilia-Romagna: Parma (Napoli). Synonymized with *Crabro curvitorsis* by Kohl, 1915:326, synonymy confirmed by de Beaumont, 1953i:11. – A. Costa, 1871b:59 (in revision of Italian Sphecidae); Baldini, 1894:70 (Italy: Modena area). – **As *Brachymerus filigranus***: Kirchner, 1867:224 (new generic assignment, in catalog of European Hymenoptera); A. Costa, 1871c:98 (description of ♀), pl. III fig. 8 (color illustration).

*Blepharipus rondani* Spinola: A. Costa, 1871:59, footnote, nomen nudum (as *Rondani*, incorrect original capitalization). Synonymized with *Crabro curvitorsis* by Kohl, 1915:327. – Casolari and Casolari Moreno, 1980:118 (specimens in M. Spinola collection).

As *Fertonius luteicollis*: Ferton, 1896a:270 (comparison with *Fertonius formicarius*), corrected to *Crabro curvitorsis* by Kohl, 1915:325.

### 7. *cutucu* M. Cooper

*Tracheliodes cutucu* M. Cooper, 1988a:107, ♀, ♂. Holotype: ♀, Ecuador: Morona-Santiago: Cordillera de Cutucu, 6 km E Macas (MBNH). – Amarante, 2002:34 (in catalog of Neotropical Crabronidae); Leclercq and Cambra, 2003b:26 (corrections to original description, Costa Rica, Ecuador, Paraguay); Fernández and Amarante, 2004:491 (in key to Neotropical *Tracheliodes*, first record from Colombia); Leclercq, 2005a:4 (in key to New World *Tracheliodes*), 5 (bibliographic reference).

### 8. *foveolineatus* (Viereck)

*Crabro foveolineatus* Viereck, 1909:44, ♀. Holotype: ♀, USA: California: Shasta County: no specific locality (ANSP). – Cresson, 1928:53 (holotype in ANSP). – **As *Tracheliodes foveolineatus***: Pate, 1942b:241 (new generic assignment, in revision of *Tracheliodes*); Krombein *in* Muesebeck, Krombein, and Townes, 1951:1015 (in catalog of North American Hymenoptera); Leclercq, 1954c:243 (in catalog of world Crabronini); F. Parker and R. Bohart, 1966:95 (California: Davis, Nevada: Verdi; prey: workers of *Liometopum occidentale luctuosum* Wheeler, Formicidae); R. Bohart and Menke, 1976:405 (in checklist of world Sphecidae); Krombein, 1979b:1671 (in catalog of North American Hymenoptera); K. Cooper, 1985a:467 (redescription of female, description of male and larva), 1985b:156 (nest; reversal of cocoon orientation); Nemkov, 1988:119 (in key to Holarctic *Tracheliodes*), 121 (bibliographic reference, correction to Pate's description); Leclercq, 2005a:3 (in key to New World *Tracheliodes*), 5 (locality records, additional description).

### 9. *ghilarovi* Nemkov

*Tracheliodes ghilarovi* Nemkov, 1988a:119, ♀, ♂. Holotype: ♀, Russia: Maritime Province: Vladivostok (ZIL). – Nemkov, 1988a:119 (in key to Holarctic *Tracheliodes*); Nemkov *in* Nemkov, Kazenas, Budrys, et Antropov, 1995:441 (in key to Sphecidae of Russian Far East); Nemkov, 2008b:22 (in catalog of Crabronidae of Asiatic Russia), 2009a:65 (is an endemic of Russian Far East), 2009b:112 (in new catalog of Sphecidae and Crabronidae of Asiatic Russia), 2009c:237 (Russia: Primorskiy Krai: Lazovsky Nature Reserve), 2011:95 (in Russian Far East oc-

curing only in Primorskiy Kray), 2012c:445 (in catalog of Crabronidae of Russian Far East); Antropov, 2017b:236 (in catalog of Crabroninae of Russia).

### 10. *herinaceus* Gribodo

*Crabro herinaceus* Gribodo, 1894b:23, ♀, ♂. Lectotype: ♂, Tunisia: Tunis area (MSNG), designated by de Beaumont, 1950e:266. Synonymized with *Crabro quinquenotatus* by Kohl, 1915:325, synonymy confirmed by de Beaumont, 1950e:266. – Zavattari, 1913a:4 (omitted from Dalla Torre's 1897 catalog); Penati and Mariotti, 2015:12 (reference to unpublished manuscript by Gribodo), 65 (in list of Hymenoptera described by G. Gribodo); Le Divelec, 2020:245 (in key to *Tracheliodes quinquenotatus* species complex), 246 (as valid species, in revision of *Tracheliodes quinquenotatus* species complex).

*Crabro quinquenotatus* var. *khoudja* Doumandji and Doumandji, 1988:107, ♀. Syntypes: Algeria: El Harrache, a suburb of Alger (type location not indicated, possibly Institut National Agronomique d'El-Harrach). Not available: taxon infrasubspecific (Articles 10.2 and 45.6.3 of the Code). Synonymized with *Tracheliodes herinaceus* by Le Divelec, 2022:246.

As *Crabro quinquenotatus* (present correction to *Tracheliodes herinaceus* based on Le Divelec, 2022): Morice, 1911:133 (Algeria: Azazga, Bône, Hippône); von Schulthess, 1926b:219 (Tunisia); Nadig, 1933:77 (Morocco: Asni); de Beaumont, 1950f:412 (Algeria). As *Tracheliodes quinquenotatus*: Bequaert, 1922:283 (new generic assignment, known prey and nest described; Algeria: Alger); de Beaumont, 1957a:153 (Morocco); Leclercq, 1993c:42 (specimens from North Africa).

### 11. *hicksi* Sandhouse

*Tracheliodes hicksi* Sandhouse, 1936:2, ♀. Holotype: ♀, USA: Colorado: Boulder County: Boulder (USNM). – Hicks, 1936:4 (preying on ants *Liometopum* sp.); Pate, 1942b:237 (in revision of *Tracheliodes*); Krombein in Muesebeck, Krombein, and Townes, 1951:1015 (in catalog of North American Hymenoptera); Leclercq, 1954c:243 (in catalog of world Crabronini); R. Bohart and Menke, 1976:405 (in checklist of world Sphecidae); Krombein, 1979b:1671 (in catalog of North American Hymenoptera); Leclercq, 1981a:241 (Mexico: Nuevo Leon, San Luis Potosí); Nemkov, 1988:118 (in key to Holarctic *Tracheliodes*), 121 (bibliographic reference); Amarante, 2002:34 (in catalog of Neotropical Crabronidae); Leclercq, 2005a:3 (in key to New World *Tracheliodes*), 6 (locality records from Mexico).

### 12. *labitubercutus* L. Ma and Q. Li

*Tracheliodes labitubercutus* L. Ma and Q. Li, 2011:144, ♀. Holotype: ♀, China: Zhejiang Province: Mount Xitianmu (Zhejiang University, Hangzhou, China). – M. Li and Q. Li, 2011:146 (in key to *Tracheliodes* of China).

### 13. *leclercqi* Melo and Rosa

*Tracheliodes leclercqi* Melo and Rosa, 2015:422, ♀, ♂. Holotype: ♀, Brazil: São Paulo: Ribeirão Preto: University of São Paulo Campus (Department of Zoology, Universidade Federal do Paraná, Brazil).

### 14. *panamae* Leclercq and Cambra

*Tracheliodes panamae* Leclercq and Cambra, 2003b:27, ♀. Holotype: ♀, Panamá: Parque Nacional Darién: Estación Rancho Frío (FSAG). – Leclercq, 2005a:4 (in key to New World *Tracheliodes*), 6 (bibliographic reference), 2007g:195 (holotype in FSAG).

### 15. *pygidialis* Q. Li and He

*Tracheliodes pygidialis* Q. Li and He, 1999b:146, ♀. Holotype: ♀, China: Zhejiang Province: Xitianmushan (Zhejiang Agricult. Univ.). – Q. Li and He, 2001:757 (China: Tianmushan Nature Reserve at 30°22'N 119°26'E), 2004:1094 (China: in hymenopterous fauna of Zhejiang Province); M. Li and Q. Li, 2011:146 (in key to *Tracheliodes* of China).

### 16. *quinquenotatus* (Jurine)

*Crabro quinquenotatus* Jurine, 1807:212 and pl. 11, Fig. 27, ♀ (as *5 notatus*, incorrect original spelling). Holotype: ♀, Europe: no specific locality, probably Italy (MHNG). – Audouin, 1824a:5 (in Dictionnaire classique d'histoire naturelle); Vander Linden, 1829:59 (bibliographic references, Italy: Genova); Lepeletier de Saint Fargeau and Brullé, 1835:809 (discussion of species identity); Frei-Gessner, Kohl, and Kriechbaumer, 1882:393 (Jurine's name is valid); Dalla Torre, 1897:622 (in catalog of world Sphecidae); Bignell, 1900:264 (Corsica: Bonifacio, preying on ants); Mantero, 1905:71 (Italy: Toscana: Isola del Giglio); Kohl, 1915:324 (in revision of Palearctic Crabronini); Ferton, 1923:340 (yellow color replaced by white in Corsica and Sardinia = *Crabro formicarius*); Giordani Soika, 1932a:23 (Italy: Lido di Venezia); E. Nielsen, 1933:273 (summary of observations on prey); Grandi, 1934:32 (nesting habits, description of mature larva); Giordani Soika, 1944:8 (Italy: Sicily: Porto Empedocle); Guiglia, 1944b:34 (Italy); de Beaumont, 1945:479 (occurrence in Switzerland doubtful); Guiglia, 1948c:202 (Italy: Sardegna: Cagliari); Zavadil in Zavadil and Šnoflak, 1948:123 (in key to Sphecidae of Czechoslovakia, not yet found in Czechoslovakia); de Beaumont, 1954e:98 (Italy); Bytinski-Salz, 1956:227 (Turkey: Aydm); Balthasar, 1972:93 (in Sphecidae Fauna of Czechoslovakia, not yet found in country). – **As *Tracheliodes quinquenotatus***: Grandi, 1928a:23 (nest and prey), 25 (description of larva), 1935a:45 (nesting in hard soil in shadowy habitats); Leclercq, 1954c:243 (in catalog of world Crabronini); Evans, 1957b:103 (discussion of larval characters); de Beaumont, 1959a:43 (Italy), 1960a:23 (Greece: Island of Rhodes); Grandi, 1961:246 (nesting habits), 529 (description of larva), 1962:98 (Italy); Zangheri, 1969:1707 (Italy: in catalog of flora and fauna of Romagna Region); de Beaumont, Bytinski-Salz and Pulawski, 1973:23 (Bodenheimer's 1937 record is probable); R. Bohart and Menke, 1976:405 (in checklist of world Sphecidae); Pulawski, 1978:265 (in key to Sphecidae of European part of USSR); Pagliano, 1980:122 (Italy: Umbria); Steiner, 1986:107 (references to publications on nesting habits); Nemkov, 1988:119 (in key to Holarctic *Tracheliodes*, bibliographic references); Pagliano, 1990:94 (in catalogue of Italian Sphecidae); Dollfuss, 1991:160 (in key to Sphecidae of North and Central Europe); Gayubo, Borsato, and Osella, 1991:407 (Italy: Emilia, Sicilia); Pagliano, 1991b:358 (in key to Italian Crabroninae); Schembri, 1991:183 (first record from Malta); Gayubo, Borsato, and Osella, 1992:285 (France: Corse); Bitsch and Leclercq, 1993:230 (in revision of western European Crabroninae); Leclercq, 1993c:42 (locality records Italy and Malta only); Negrisolò and Pagliano, 1993:93 (Italy: Sardegna); Negrisolò in Minelli, Ruffo, and La Posta, 1995b:8 (in catalog of Italian fauna); Vicidomini, 2000b:28 (Italy: previously recorded from Campania); Generani, Pagliano, Scaramozzino, and Strumia, 2003:65 (Italy: Arcipelago Toscano); Schmid-Egger, 2003:759 (Italy: Sicilia: Armerina, Gela, Madonie, Ragusa); Pagliano and Negrisolò, 2005:299 (in Sphecidae Fauna of Italy); Magdalou, 2006c:8 (France: Pyrénées-Orientales: Réserve Naturelle du Mas-Larrieu); Roche, 2007a:141 (the only Egyptian record is Port Said, probably an accidental introduction); G. Turrisi and R. Turrisi, 2007:120 (Italy: Sicilia: Mount Etna: Botanical Garden Nuova Gussonea and vicinity); Pagliano, 2009:182 (Italy: Liguria: Villanova d'Albenga; Marche: Offida); Yıldırım, Ljubomirov, and Lelej, 2014:15 (distribution in Turkey by biogeographic provinces); Koçak and Kemal, 2015:153 (in checklist of Hymenoptera of Turkey); Schmid-Egger, Dandria, and Xuereb, 2016:80 (in checklist of Crabronidae of Maltese Islands); Turrisi, Altadonna, Lo Cascio, Nobile, and Selis, 2020:728 (Italy: Aeolian Archipelago: islands of Lipari and Vulcano); Bitsch and Leclercq in Bitsch, Antropov, Gayubo, Leclercq, Schmid-Egger, K. Schmidt, and Straka, 2021:154 (in revision of Sphecidae *sensu lato* of Europe); Le Divelec, 2022:246 (in key to *Tracheliodes quinquenotatus* species complex), 247 (in revision of *Tracheliodes quinquenotatus* species complex; Turkey westward to Corsica, not occurring in North Africa, Iberian Peninsula, or continental France); Kaplan and Yildirim, 2021:60 (in catalog of Crabronidae of Turkey), 2023:1688 (in checklist of Sphecidae *sensu lato* of Turkey).

*Crossocerus luteicollis* Lepeletier de Saint Fargeau and Brullé, 1835:769, ♂. Holotype or syntypes: ♂, origin unknown (lost). Neotype: holotype of *Crabro quinquenotatus* Jurine, designated by Le Divelec, 2022:247. Synonymized with *Crabro quinquenotatus* by Kohl, 1915:324. – Lepeletier de Saint Fargeau, 1845:172 (in revision of world Hymenoptera). – **As *Crabro luteicollis***: Dahlbom, 1845:384 (new generic assignment, original description copied), 528 (species transitional to *Blepharipus*, unknown to the author); F. Smith, 1856:425 (in catalog of Hymenoptera in

- British Museum). – **As *Fertonius luteicollis***: Ferton, 1892:341 (new generic assignment, nesting habits near Alger, prey: *Tapinoma erraticum* Latreille). – **As *Brachymerus luteicollis***: Adlerz, 1904:136 (new generic assignment, known prey: ant *Tapinoma erraticum*); Ferton, 1923:146 (nesting habits); Piek and Spanjer, 1986:181 (in list of Sphecidae with known prey).
- Crabro bucephalus* F. Smith, 1856:416, ♂. Holotype or syntypes: ♂, Italy: Sicilia: no specific locality (BMNH). Synonymized with *Crabro quinquenotatus* by Frei-Gessner, Kohl, and Kriechbaumer, 1882:395. – A. Costa, 1867c:131 and 1871b:60 (in revision of Italian Sphecidae); Dalla Torre, 1897:585 (in catalog of world Sphecidae). – **As *Blepharipus bucephalus***: A. Costa, 1884b:33 (new generic assignment, Italy: Sardegna: Tirso a Fordongianus). – **As *Tracheliodes bucephalus***: A. Costa, 1893b:8 (new generic assignment, Tunisia).
- Blepharipus politus* A. Costa, 1871:61. Nomen nudum. Synonymized with *Crabro quinquenotatus* by Kohl, 1915:324. – Palma, 1867:41 (Italy: Sicilia settentrionale).
- Fertonius formicarius* Ferton, 1896a:268, ♀, ♂. Lectotype: France: Corse: Bonifacio (MNHN), designated by Le Divelec, 2022:247. Synonymized with *Crabro quinquenotatus* by Kohl, 1915:325. – Piek and Spanjer, 1986:184 (in list of Sphecidae with known prey, as *Feronius*).
- Nec following authors (= *Tracheliodes herinaceus*): Morice, 1911:133; von Schulthess, 1926b:219; Nadig, 1933:77; de Beaumont, 1950f:412. – **As *Tracheliodes quinquenotatus***: Bequaert, 1922:283; de Beaumont, 1957a:153; Leclercq, 1993c:42.
- Nec following authors (= *Tracheliodes trochantericus*): Antiga and Bofill, 1904:23; E. Saunders, 1904c:608; Berland, 1925d:179 (continental France only); Bernard, 1934b:250; Giner Marí, 1934:136; Bernard, 1936c:288; Giner Marí, 1934:136; Bernard, 1936c:288; de Andrade, 1949:23; Ceballos, 1956:395, 1959:231; Diniz, 1959:32; Ceballos, 1964:95. – **As *Brachymerus quinquenotatus***: de Gaulle, 1908:122 (continental France only). – **As *Tracheliodes quinquenotatus***: Bernard, 1935:67; Morel, Nouvel, and Ribaut, 1956:339; Richards, 1957:23; Nouvel and Ribaut, 1958:16; Suárez, 1959:60; Leclercq, 1971:228; de Beaumont, 1962b:28; Erlandsson, 1974:85; Leclercq, 1975b:2; Gayubo, 1982b:26, 1982e:105, 1984b:94 Gayubo and Tormos, 1984:18; Gayubo, 1986a:63, 1986d:117; Gayubo and Heras, 1986:56; Gayubo and Sanza, 1986:67; Gayubo and Tormos, 1986a:15; Asís and Jiménez, 1987:27; Gayubo, Asís, and Tormos, 1990b:76; Gayubo and Torres, 1991:Table I; Leclercq, 1993c:42 (locality records from Spain and North Africa); Leclercq and Barbier, 1993:93; Torregrosa, Gayubo, Tormos, and Asís, 1993:20; Tormos, Asís, and Gayubo, 1994:189, 215; Gonzáles, Gayubo, and Torres, 1998:74, 75; Gayubo, García, Torres, and González, 1999:91; González, Gayubo, and Torres, 1999:355; Gayubo, González, and Torres, 2000:186; Drewes, 2003:143; Nieves-Aldrey, Fontal-Cazalla, Garrido-Torres, and Rey del Castillo, 2003:42; Dollfuss, 2004b:783 (specimens from Morocco, Spain, Tunisia, and Turkey); Gayubo et al. 2004:131; Gayubo, Nieves-Aldrey, González, Tormos, Rey del Castillo, and Asís, 2004:108; Cruz-Sánchez, Gayubo, González, and Torres, 2005:221; Magdalou, 2006b:109; Baños-Picón, Gayubo, Asís, and González, 2007:255, 258; Gayubo, González, Tormos, and Asís, 2008:138; Baños-Picón, Asís, Gayubo, and Tormos, 2009:313; Gayubo, González, Tormos, and Asís, 2009:364; González, Gayubo, Asís, and Tormos, 2009:625; Cruz-Sánchez, Asís, Gayubo, Tormos, and González, 2011:499; Vieira, Oliveira, Brewster, and Gayubo, 2013:17; Baldock, 2014:358; Cruz-Sánchez, Asís, Gayubo, Tormos, and González, 2011:499; Vieira, Oliveira, Brewster, and Gayubo, 2013:17; Baldock, 2014:358; Cuesta-Segura, Alvarez-Blanco, and Artíguez, 2017:10; Magdalou, 2017:17; Cross, Baldock, and Wood, 2021:39.
- As *Crossocerus decorus* (partim): Pagliano, 2011:140 (specimens in coll. Spinola, Torino, are *Tracheliodes quinquenotatus*).

### 17. *rhysoleuralis* Q. Li

- Tracheliodes rhysoleuralis* Q. Li, 1999:115, ♀, ♂. Holotype: ♀, China: Zhejiang Province: Hangzhou (Zhejiang Agric. Univ.). – Q. Li and He, 2001:757 (China: Tianmushan Nature Reserve at 30°22'N 119°26'E), 2004:1094 (in hymenopterous fauna of Zhejiang Province, China; authorship attributed to Q. Li and He, in error); Miao Li and Q. Li, 2011:146 (in key to *Tracheliodes* of China, authorship attributed to Q. Li and Miao Li, in error).

### 18. *trochantericus* (Herrich-Schaeffer)

*Ceratocolus* ? *trochantericus* Herrich-Schaeffer, 1841:46, ♀ (spelled *trochantericus* on p. 45 and *trochanteribus* on p. 46; spelling *trochantericus* selected as valid by Le Divelec, 2022:258, acting as first reviser). Holotype: ♀, Spain: no specific locality (lost). Neotype: ♀, Spain: Barcelona (MNHN), designated by Le Divelec, 2022:258.– A. Morawitz, 1866a:250 (possibly a *Tracheliodes*); Le Divelec, 2022:246 (in key to *Tracheliodes quinquenotatus* species complex), 258 (as valid species, in revision of *Tracheliodes quinquenotatus* species complex; continental France, Spain including Balearic Islands, and Sardinia).

*Crossocerus festivus* Marquet, 1881:188, sex not stated. Syntypes: France: Hérault: Montpellier, Narbonne, Cette, now Sète (Lausanne). Synonymized with *Crabro quinquenotatus* Jurine by Kohl, 1915:324, synonymy confirmed by de Beaumont, 1952b:89, and with *Tracheliodes trochantericus* by Le Divelec, 2022:258. – de Gaulle, 1908:122 (in catalog of French Hymenoptera). – As *Crabro festivus*: Dalla Torre, 1897:600 (new generic assignment, in catalog of world Sphecidae).

As *Crabro quinquenotatus* (present correction based on Le Divelec, 2022): Antiga and Bofill, 1904:23 (Spain: Cataluña Province); E. Saunders, 1904c:608 (Spain: Mayorca); Berland, 1925d:179 (in Sphecid Fauna of France, continental France only); Bernard, 1934b:250 (prey: *Tapinoma erraticum* Latreille, a formicid); Giner Marí, 1934:136 (Spain); Bernard, 1936c:288 (France: Hérault: Valvras; Pyrénées-Orientales: Banyuls-sur-Mer, Collioure; Var: Foux, Fréjus); de Andrade, 1949:23 (Portugal); Ceballos, 1956:395 (in catalog of Sphecidae of Spain), 1959:231 (in supplement to catalog of Spanish Sphecidae); Diniz, 1959:32 (Portugal: Évora, Lisboa, Mata de Leiria, Paço de Rei); Ceballos, 1964:95 (in supplements to catalog of Spanish Sphecidae). – As *Brachymerus quinquenotatus*: de Gaulle, 1908:122 (new generic assignment, in catalog of French Hymenoptera, continental France only). – As *Tracheliodes quinquenotatus*: Bernard, 1935:67 (France: Var: Fréjus area); Morel, Nouvel, and Ribaut, 1956:339 (France: Département des Pyrénées-Orientales); Richards, 1957:23 (Spain: Gerona: beaches of Ampurias and Pals); Nouvel and Ribaut, 1958:16 (France: Pyrénées-Orientales: Banyuls-sur-Mer); Suárez, 1959:60 (Spain: Almería Province); Leclercq, 1971:228 (Spain); de Beaumont, 1962b:28 (Spain); Erlandsson, 1974:85 (Spain); Leclercq, 1975b:2 (France); Gayubo, 1982b:26 (Spain: Ávila and Salamanca provinces), 1982e:105 (Spain: Cádiz Province); Gayubo, 1984b:94 (Spain: Salamanca Province), 1984c:377 (Portugal: El Algarve Province); Gayubo and Tormos, 1984:18 (Spain: Valencia); Gayubo, 1986a:63 (Spain: Ciudad Real Province), 1986d:117 (Spain: Zamora Province); Gayubo and Heras, 1986:56 (Spain: Segovia and Valladolid Provinces); Gayubo and Sanza, 1986:67 (Spain: Burgos); Gayubo and Tormos, 1986a:15 (Spain: Castellón de la Plana); Asís and Jiménez, 1987:27 (Spain: Castellón Province); Gayubo, Asís, and Tormos, 1990b:76 (Spain: Cáceres and Teruel Provinces); Gayubo and Torres, 1991:Table I (Spain: Salamanca; effects of urban pressure); Leclercq, 1993c:42 (locality records from Spain); Leclercq and Barbier, 1993:93 (map of distribution in France); Torregrosa, Gayubo, Tormos, and Asís, 1993:20 (Spain: Alicante Province); Tormos, Asís, and Gayubo, 1994:189, 215 (Spain: Albacete Province); González, Gayubo, and Torres, 1998:74, 75 (Spain: Valladolid Province); Gayubo, García, Torres, and González, 1999:91 (Spain: Soria Province); González, Gayubo, and Torres, 1999:355 (Spain: Valladolid: Viana de Cega); Gayubo, González, and Torres, 2000:186 (Spain: Salamanca Province); Drewes, 2003:143 (Spain: Tarragona); Nieves-Aldrey, Fontal-Cazalla, Garrido-Torres, and Rey del Castillo, 2003:42 (Spain: Madrid: Estación Biogeológica de El Ventorrillo in Sierra de Guadarrama); Dollfuss, 2004b:783 (specimens from Spain); Gayubo et al. 2004:131 (Spain: Madrid: Estación Biogeológica de El Ventorrillo in Sierra de Guadarrama); Gayubo, Nieves-Aldrey, González, Tormos, Rey del Castillo, and Asís, 2004:108 (Spain: Madrid: Monte de El Pardo); Cruz-Sánchez, Gayubo, González, and Torres, 2005:221 (Spain: Salamanca: San Martín del Castañar); Magdalou, 2006b:109 (France: Pyrénées-Orientales: Mas Larrieu Nature Reserve near Argelès-sur-Mer); Baños-Picón, Gayubo, Asís, and González, 2007:255, 258 (Spain: Zamora: Cabañas de Aliste); Gayubo, González, Tormos, and Asís, 2008:138 (Spain: Salamanca: Parque Natural de Las Batuecas–Sierra de Francia); Baños-Picón, Asís, Gayubo, and Tormos, 2009:313 (Spain: frequency of specimens collected with hand nets and Malaise traps); Gayubo, González, Tormos, and Asís, 2009:364 (Spain: Valladolid: Reserva Natural Ri-

beras de Castronuño–Vega del Duero); González, Gayubo, Asís, and Tormos, 2009:625 (Spain: Salamanca and Zamora provinces: Arribes del Duero Natural Park); Cruz-Sánchez, Asís, Gayubo, Tormos, and González, 2011:499 (Spain: Salamanca and Zamora provinces: Arribes del Duero Natural Park: effects of wildfire); Vieira, Oliveira, Brewster, and Gayubo, 2013:17 (Portugal: Douro International Natural Park and Serras de Aire e Candeeiros Natural Park); Baldock, 2014:358 (Spain: Island of Mallorca); Cuesta-Segura, Alvarez-Blanco, and Artíguez, 2017:10 (distribution in Iberian Peninsula and Balearic Islands); Magdalou, 2017:17 (France: Pyrénées-Orientales: Réserves Naturelles Catalanes: Forêt de la Massane, Mas Larrieu); Cross, Baldock, and Wood, 2021:39 (in catalog of Sphecidae *sensu lato* of Portugal).

### 19. *varus* (Panzer)

*Crabro varus* Panzer, 1799:Heft 62:17, [♀]. Holotype or syntypes: ♀, Austria: no specific locality (lost: Panzer, 1806:184). Neotype: ♀, Austria: Niederösterreich: Marchegg (NHMW), designated by Zettel et al., 2004:42. – Schrank, 1802:338 (Germany: in revision of insects of Bayern, as *varus* Fabricius); Panzer, 1806:184 (in critical review of his previous work); Jurine, 1807:212 (in checklist of species of *Crabro*); Vander Linden, 1829:61 (bibliographic references, Austria); Lepeletier de Saint Fargeau and Brullé, 1835:810 (discussion of species identity); Dalla Torre, 1897:636 (in catalog of world Sphecidae); Kohl, 1915:348 (original description copied); Richards, 1935a:167 (has priority over Lepeletier de Saint Fargeau and Brullé, 1835); Peets, 1909-1911:66 (as new synonym of *Crabro quadrimaculatus* Fabricius, 1793); Leclercq, 1979a:25 (as new synonym of *Crossocerus vagabundus*). – **As *Tracheliodes varus***: Bitsch and Leclercq, 1993:231 (new generic assignment, redescription); Leclercq, 1993c:43 (single known specimen from Corsica; type lost); Leclercq and Barbier, 1993:94 (map of distribution in France); Dollfuss, 2004b:784 (Bulgaria: Primorsko, Czech Republic: Ladna, Slovakia: no specific locality); Zettel et al., 2004:42 (Austria, Czech Republic, Bulgaria, France, Slovakia, redescription, preying on ant *Liometopum microcephalum* (Panzer)); Vepřek, Mihal, and Klváček, 2006:221 (recognition characters, prey; in Czech); Vepřek and Straka, 2007:207 (in catalog of Sphecidae of Czech Republic and Slovakia), 232 (Moravia: Lednice); Bitsch and Leclercq, 2009:227 (in supplement to vol. I of Faune de France, 1993: reference to Zettel et al., 2004; the prey, *Liometopum microcephalum* does not occur in Corsica, and *Tracheliodes varus* must prey on another ant there); Mei, 2016:17 (Italy: Umbria: Città di Castello; Lazio: Manziana and Nettuno); Bitsch and Leclercq in Bitsch, Antropov, Gayubo, Leclercq, Schmid-Egger, K. Schmidt, and Straka, 2021:155 (in revision of Sphecidae *sensu lato* of Europe).

### sp.

Ghazi-Soltani, Ebrahimi, Iranipour, and Pour Abad, 2010:800 (Iran: East Azarbaijan: Marand: Yam); Jahantigh, Rakhshani, Mokhtari, and Ramroodi, 2017:51 (Iran: East Azerbaijan Province).

## FOSSIL TRACHELIODES

### *grimaldii* Melo and Rosa

*Tracheliodes grimaldii* Melo and Rosa, 2019:1, ♀. Holotype: ♀, Dominican Republic: specific locality unknown, Dominican amber (AMNH).

### *mortuellus* Cockerell

*Tracheliodes mortuellus* Cockerell, 1906:44, sex not stated. Holotype: USA: Colorado: Florissant, Lower Oligocene (MCZ). – Pate, 1942b:234 (in revision of *Tracheliodes*); Leclercq, 1954c:243 (in catalog of world Crabronini); R. Bohart and Menke, 1976:31, 405 (in checklist of world Sphecidae).

### *succinalis* (Cockerell)

*Crabro succinalis* Cockerell, 1909b:3, ♀. Syntypes: Baltic amber (originally Königsberg Mus., now lost). – **As *Tracheliodes succinalis***: Leclercq, 1954c:242 (in catalog of world Crabronini); R. Bohart and Menke, 1976:31, 405 (in checklist of world Sphecidae); Bennett and Engel, 2006:7 (in checklist of amber Sphecidae *sensu lato*).

***tornquisti* (Cockerell)**

*Crabro tornquisti* Cockerell, 1909b:3, sex not stated. Holotype: Baltic amber (originally Königsberg Mus., now lost). –

**As *Tracheliodes tornquisti*:** Leclercq, 1954c:242 (new generic assignment, in catalog of world Crabronini);

R. Bohart and Menke, 1976:31, 405 (in checklist of world Sphecidae); Bennett and Engel, 2006:7 (in checklist of amber Sphecidae *sensu lato*).