

A faunistic survey of Pteromalidae (Hymenoptera: Chalcidoidea) in Golestan Province, Northern Iran, with an updated checklist of Iran

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Abstract

During a faunistic survey in Golestan province (Northern Iran), 12 species of Pteromalidae (Hymenoptera: Chalcidoidea) in 11 genera were collected and identified. Two species, *Dipara claviger* (Kieffer, 1906) and *Halticoptera triannulata* (Erdos, 1946) are newly recorded from Iran. Updated checklist of Iranian Pteromalidae comprises 295 species in 124 genera is given.

Keywords

Pteromalidae, fauna,
Golestan, checklist and
Iran.

Introduction

Pteromalidae are the third most speciose family of Chalcidoidea after Eulophidae and Encyrtidae, with 4,257 extant and 26 fossil species in 648 genera (Ghahari *et al.*, 2021). They are distributed in all biogeographical areas of the world, and are mostly primary or secondary, solitary or gregarious parasitoids of holometabolous insects, most commonly of Lepidoptera, Coleoptera and Diptera (Goulet and Huber, 1993; Bouček and Heydon, 1997 and Gibson *et al.*, 2021).

The most comprehensive catalogue of Iranian Pteromalidae has been published by Gibson *et al.* (2021) with 276 valid species and subspecies belonging to 120 genera and 16 subfamilies. References to all the Iranian records with their distribution within Iran and their Iranian hosts are available in it, together with global distribution and taxonomic remarks. Additionally, eight species and four genera were excluded from the fauna of Iran by the mentioned catalogue. After that, other authors have made contributions to the Iranian fauna as follow:

Ghahari (2020): *Dinotiscus aponius* (Walker, 1848), and *Homoporus laeviusculus* Erdős, 1953,

Lotfalizadeh *et al.* (2020): *Homoporus febriculosus* (Girault, 1917), *Norbanus persicus* Lotfalizadeh and Rasplus, 2020, and

Stenomalina delvarei Lotfalizadeh and Rasplus, 2020,

Rahmani *et al.* (2020): *Harrizia mira* Delucchi, 1962, Shojaey *et al.* (2020): *Rhynocoelia impar* (Walker, 1836), Rahmani *et al.* (2021): *Dinarmus altifrons* (Walker, 1862), and *Syntomopus incurvus* Walker, 1833, Shojaey *et al.* (2021): *Coelopisthia areolata* Askew, 1980, *Norbanus brevicornis* Szelenyi, 1974, *Pachyneuron gibbiscuta* Thomson, 1878, and *Sphigigaster pedunculiventris* (Spinola, 1808), Rahmani *et al.* (2022): *Blascoa ephedrae* Askew, 1997, *Plutothrix trifasciata* (Thomson, 1878), and *Homoporus pulchripes* Erdős, 1953 and Taher *et al.* (2022): *Mesopolobus aspilus* (Walker, 1835).

Of course, in addition to the mentioned papers, some other faunistic works have been published on Iranian Pteromalidae but without new country records; so, we do not consider them in this checklist.

Since the catalogue of Gibson *et al.* (2021) comprises all the published records until the end of 2019, so we represent an updated checklist includes all the data after the mentioned catalogue together with two new records (Totally with 19 species further than it).

Materials and methods

The pteromalid specimens of this faunistic survey were caught using Malaise traps and sweeping net in some regions of Golestan province (Northern Iran) during June

to July 2015 and August to September 2017. The specimens are preserved in the private collection of the second author. Here we follow Noyes (2022) for nomenclature, classification and distributional data.

Results and discussion

List of species

In this faunistic survey, in total, 12 species of Pteromalidae within 11 genera were collected and identified from Golestan province.

1. Genus *Caenacis* Förster, 1856

1.1. *Caenacis lauta* (Walker, 1835)

Material examined: 2♀♀, Golestan province, Galikesh, Dar-Abad, 11.6.2015.

General distribution: Austria, Belgium, Bulgaria, China, Croatia, Czech Republic, Denmark, England, France, Germany, Hungary, Iran, Italy, Moldova, Netherlands, Poland, Romania, Serbia, Slovakia, Spain, Sweden and Ukraine.

2. Genus *Chlorocythus* Graham, 1956

2.1. *Chlorocythus breviscapus* Graham, 1965

Material examined: 1♀, Golestan province, Bandargaz, Karkandeh, 27.7.2015.

General distribution: Czech Republic, England, Germany, Hungary, Netherlands, Sweden, Turkey (Noyes, 2022) and Iran (Gibson *et al.*, 2021).

3. Genus *Dibrachys* Förster, 1856

3.1. *Dibrachys microgastri* (Bouché, 1834)

Material examined: 1♂, 3♀♀, Golestan province, Kordkoy, Salikandeh, 10.9.2017; 2♂♂, Golestan province, Golestan National Park, 24.9.2017.

General distribution: Afghanistan, Algeria, Argentina, Australia, Austria, Belarus, Belgium, Bosnia Hercegovina, Brazil, Bulgaria, Canada, Chile, China, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Eritrea, Finland, France, Germany, Hungary, India, Iran, Italy, Japan, Kazakhstan, Kirgizia, Korea, Mexico, Moldova, Morocco, Netherlands, New Zealand, North Africa, Pakistan, Peru, Poland, Portugal, Romania, Russia, Serbia, Slovakia, South Africa, Spain, Sudan, Sweden, Switzerland, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, England, USA, Uruguay, former USSR, Uzbekistan and former Yugoslavia.

4. Genus *Dipara* Walker, 1833

4.1. *Dipara claviger* (Kieffer, 1906)

Material examined: 2♀♀, Golestan province, Golestan National Park, 24.9.2017. New record for Iran.

General distribution: Bosnia Hercegovina, Croatia, Greece, Italy, Romania, Turkey (Noyes, 2022) and Iran (This study).

5. Genus *Halticoptera* Spinola, 1811

5.1. *Halticoptera patellana* (Dalman, 1818)

Material examined: 1♂, 1♀, Golestan province, Minoodasht, Qaleh-Ghahfeh, 22.9.2017.

General distribution: Belgium, Brazil, Canada, Canary Islands, Chile, China, Czech Republic, France, Germany, Hawaii, Italy, Japan, Mexico, Montenegro, Netherlands, Peru, Romania, Russia, Sweden, Switzerland, Taiwan, Trinidad and Tobago, Turkey, United Kingdom, USA (Noyes, 2022) and Iran (Gibson *et al.*, 2021).

5.2. *Halticoptera triannulata* (Erdos, 1946)

Material examined: 2♀♀, Golestan province, Golestan National Park, 24.9.2017. New record for Iran.

General distribution: Austria, China, Czech Republic, Germany, Hungary, Kazakhstan, Moldova, Romania, Slovakia, Sweden, Turkey, United Kingdom (Noyes, 2022) and Iran (This study).

6. Genus *Mesopolobus* Westwood, 1833

6.1. *Mesopolobus sericeus* (Förster, 1770)

Material examined: 3♀♀, Golestan province, Galikesh, Dar-Abad, 11.6.2015.

General distribution: Andorra, Austria, Belgium, Bulgaria, Croatia, Denmark, England, France, Germany, Greece, Hungary, Iran, Israel, Italy, Kazakhstan, Moldova, Netherlands, Romania, Spain, Sweden, Turkey, Ukraine and Wales.

7. Genus *Nasonia* Ashmead, 1904

7.1. *Nasonia vitripennis* (Walker, 1836)

Material examined: 1♂, 3♀♀, Golestan province, Galikesh, Dar-Abad, 11.6.2015; 3♂♂, 2♀♀, Golestan province, Gorgan, Naharkhoran, 23.8.2017.

General distribution: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Croatia, Czech Republic, Denmark, Egypt, England, France, Germany, Hawaii, India, Israel, Italy, Japan, Kazakhstan, Kirgizia, Korea, Madeira, Moldova, Netherlands, New Caledonia, New Zealand, North Africa, Norway, Poland, Romania, Senegal, Serbia, Slovakia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Tajikistan, Turkey, USA, Uzbekistan, Zimbabwe (Noyes, 2022) and Iran (Gibson *et al.*, 2021).

8. Genus *Pachyneuron* Walker, 1833

8.1. *Pachyneuron aphidis* (Bouché, 1834)

Material examined: 1♀, Golestan province, Gorgan, Ziarat, 25.8.2017; 3♂♂, Golestan province, Kordkoy, Salikandeh, 10.9.2017; 1♂, 2♀♀, Golestan province, Minoodasht, Qaleh-Ghahfeh, 22.9.2017.

General distribution: Argentina, Armenia, Australia, Belgium, Brazil, Bulgaria, Canada, Canary Islands, Caucasus, Chile, China, Colombia, Croatia, Cuba, Czech Republic, Egypt, El Salvador, France, Germany, Greece,

Hawaii, Hungary, India, Iran, Iraq, Israel, Italy, Japan, Kazakhstan, Kirgizia, Korea, Libya, Macedonia, Mexico, Moldova, Montenegro, Morocco, Netherlands, New Zealand, Pakistan, Peru, Poland, Puerto Rico, Romania, Russia, Rwanda, Serbia, Slovakia, South Korea, Spain, Sweden, Switzerland, Syria, Tajikistan, Taiwan, Trinidad & Tobago, Turkey, Turkmenistan, Ukraine, United Kingdom, USA, Uruguay, USSR, Venezuela, Yemen and former Yugoslavia.

9. Genus *Pteromalus* Swederus, 1795

9.1. *Pteromalus puparum* (Linnaeus, 1758)

Material examined: 1♀, Golestan province, Bandargaz, Karkandeh, 27.7.2015; 2♂♂, 3♀♀, Golestan province, Gorgan, Naharkhoran, 23.8.2017.

General distribution: Algeria, Australia, Austria, Azores, Barbados, Belgium, Bermuda, Bolivia, Bulgaria, Canada, Canary Islands, Chile, China, Croatia, Czech Republic, Egypt, El Salvador, Finland, France, Germany, Greece, Hawaii, Hungary, India, Iran, Iraq, Ireland, Israel, Italy, Japan, Kazakhstan, Kirgizia, Macedonia, Madeira, Malaysia, Moldova, Mongolia, Nepal, Netherlands, New Zealand, North Africa, Pakistan, Papua New Guinea, Poland, Portugal, Romania, Russia, Saint Lucia, Saudi Arabia, Serbia, Slovakia, South Africa, South Korea, Spain, Sweden, Switzerland, Tajikistan, Taiwan, Turkey, Ukraine, United Kingdom, USA, Uruguay, former USSR, Uzbekistan and former Yugoslavia.

10. Genus *Systasis* Walker, 1834

10.1. *Systasis tenuicornis* Walker, 1834

Material examined: 1♂, 1♀, Golestan province, Bandargaz, Karkandeh, 27.7.2015.

General distribution: Belgium, China, England, Germany, Hungary, Iran, Kazakhstan, Romania, Spain and Sweden.

11. Genus *Trychnosoma* Graham, 1957

11.1. *Trychnosoma punctipleura* (Thomson, 1878)

Material examined: 1♀, Golestan province, Gorgan, Ziarat, 25.8.2017.

General distribution: Czech Republic, France, Iran, Netherlands, Slovakia, Sweden and England.

Undetermined species

In addition to the mentioned 12 identified species, the below specimens were collected.

1. *Cea* sp.

Material examined: 1♀, Golestan province, Kordkoy, Salikandeh, 10.9.2017.

2. *Glyphognathus* sp.

Material examined: 1♀, Golestan province, Minoodasht, Qaleh-Ghahfeh, 22.9.2017.

3. *Hemitrichus* sp.

Material examined: 1♂, Golestan province, Bandargaz, Karkandeh, 27.7.2015.

4. *Pteromalus* sp.

Material examined: 2♂♂, 3♀♀, Golestan province, Golestan National Park, 24.9.2017.

5. *Sphigigaster* sp.

Material examined: 2♂♂, Golestan province, Gorgan, Ziarat, 25.8.2017; 1♂, Golestan province, Minoodasht, Qaleh-Ghahfeh, 22.9.2017.

6. *Toxeuma* sp.

Material examined: 1♂, 2♀♀, Golestan province, Gorgan, Naharkhoran, 23.8.2017.

The results of several faunistic surveys on Iranian Pteromalidae indicate that the fauna of these parasitoids is diverse in this country. Until now, species diversity of pteromalids in Northern parts of Iran has poorly been studied. Due to the high diversity of vegetation in Northern Iran, and consequently abundance of pteromalids' host species (Larvae and pupa of Lepidoptera, Coleoptera and Diptera), there is a very rich fauna of these parasitoid wasps in this area (Southern parts of the Caspian Sea). More intensive and extensive surveys by Malaise traps and rearing of the hosts of these parasitoids may yield not only more species of Pteromalidae, but also determination of parasitoid-host relationships in order to establishment of biological control programs.

Recently Rahmani *et al.* (2022) excluded a considerable number of pteromalid species from the catalogue of Gibson *et al.* (2021), and stated that all the pteromalid species recorded by Abd-Rabou *et al.* (2005a and 2019) and Sakenin *et al.* (2008a, b, and 2019) are irrelevant records to Iran. None of the authors of the mentioned paper (Rahmani *et al.* 2022) requested to re-examine the voucher specimens which all of them were identified or confirmed by the authorized chalcidoidologists; of course, neither of the authors of the mentioned paper is authorized expert on Pteromalidae because of several published works on various families of Hymenoptera, and even other insect orders.

Certainly, considering the records under doubtful based on prediction, prejudice or unjustified reasons can't be trusted. In order to exclusion a taxon from a fauna, concrete and reliable taxonomic evidences are necessary, not citing to an old paper (Abd-Rabou *et al.*, 2005b) included a few misidentified species of another taxon (Vespidae!)¹. On the other hand, all the

¹ Regarding to the paper Abd-Rabou *et al.* (2005b), after receiving V. Mauss's agreement, a large parcel included several Vespidae and Apoidea specimens was sent to him

in 2004 to be identified by him, M. Ohl and T. Osten, but have not been done so far (H. Ghahari, pers. comm.).

vespine misidentified species of Abd-Rabou *et al.* (2005b) were discussed and excluded by Dvorak, Ghahari, Carpenter and Abbasi (2012), as well as the masarine misidentified species in another paper. Therefore, there is no need for hasty criticism against authors who always corrected misidentified taxa through re-examining of specimens by the authorized experts.

Misidentification is common in taxonomic works, and respecting H. Lotfalizadeh's taxonomic papers, other three authors of the mentioned paper (Rahmani *et al.*, 2022) had scientific mistakes (Especially doubtful records) in their works. It is important for a researcher to have the courage and honesty to correct the prior published scientific mistakes. Additionally, the authors of the mentioned paper claimed wrongly that the papers Abd-Rabou *et al.* (2005a, 2019) and Sakenin *et al.* (2008a, b, 2019) were published without a peer-review process; while all the mentioned journals are peer-reviewed and the papers were reviewed by at least two anonymous reviewers. Additionally, these journals are published by Egyptian Ministry of Agriculture, or Islamic Azad University of Iran, and are quite creditable.

Updating the checklists is necessary in order to provide researchers with the species diversity of a taxon in various regions of the world, and on the other hand, the species that were previously reported from an area, are not introduced again as new records [e.g., *Psilocera obscura* Walker, 1833 and *Stinoplus etearchus* (Walker, 1848)] had been recorded by Ghahari *et al.* (2015) and Sakenin *et al.* (2008a), respectively, but were reported again as new country records by Rahmani *et al.* (2020b)].

Additionally, Rahmani *et al.* (2022) prepared an incomplete checklist on the Middle East and North African Pteromalidae, while numerous published papers in those countries were not considered and cited. It is great to follow the example of other researchers who published on the Middle East fauna, but in order to preparing a comprehensive checklist, it is necessary to review carefully all the papers, books and other published scientific sources related to the subject.

Finally, the pteromalid species reported by H. Ghahari (In his previous published works), in addition to being previously identified or confirmed by the authorized specialists, but some of doubtful specimens were re-examined by the experts (H. Ghahari, pers. comm.), and thus are reliable. Therefore, regarding to the new published contributions after Gibson *et al.* (2021) and two new records of this survey, the total number of

Iranian Pteromalidae reaches to 295 valid species in 124 genera (Appendix 1). Same as the catalogue of Gibson *et al.* (2021), the present updated checklist comprises only the known species (Not genera with unidentified species); so, six genera with unknown species (*Cea* sp., *Guancheria* sp., *Glyphognathus* sp., *Hypopteromalus* sp., *Oxysychus* sp. and *Thureonella* sp.) are not included in this checklist until determining the species name.

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References

- Abd-Rabou, S.; Ghahari, H.; Huang, J. and Bouček, Z. (2005a):** New records of aphelinid and pteromalid wasps (Hymenoptera: Chalcidoidea: Aphelinidae, Pteromalidae) from Iran. *Egyptian Journal of Agricultural Research*, 83(4): 1619–1623.
- Abd-Rabou, S.; Ghahari, H.; Mauss, V. and Plant, J. (2005b):** New records of Apidae, Andrenidae, Sphecidae and Vespidae (Hymenoptera) from Iran. *Egyptian Journal of Agricultural Research*, 83(4): 1613–1618.
- Abd-Rabou, S.; Samin, N.; Sakenin Chelav, H.; Amoughli Tabari, M.; Trjapitzin, V.A. and Sureshan, P.M. (2019):** New records of Encyrtidae, Eulophidae, Eurytomidae, Mymaridae, Pteromalidae and Torymidae (Hymenoptera Chalcidoidea) from Iran. *Egyptian Journal of Plant Protection Research Institute*, 2: 648–652.
- Bouček, Z. and Heydon, S.L. (1997):** Family Pteromalidae, pp. 541–692. In: Gibson, G.A.P., Huber, J.T. and Wooley, J.B. (eds), *Annotated Keys to the Genera of Nearctic Chalcidoidea* (Hymenoptera). National Research Council Canada, NRC Research Press, Ottawa, pp 794.
- Dvorak, L.; Ghahari, H.; Carpenter, J.M. and Abbasi, R. (2012):** On the

- distribution and taxonomy of vespine wasps of Iran (Hymenoptera: Vespidae: Vespinae). *Acta Musei Moraviae, Scientiae biologicae* (Brno), 97(2): 69–86.
- Ghahari, H. (2020):** A study on the fauna of predator and parasitoid arthropods in saffron fields (*Crocus sativus* L.). *Journal of Saffron Research*, 7(2): 27–39. [in Persian, English summary]
- Ghahari, H.; Doğanlar, M.; Sureshan, P.M. and Ostovan, H. (2015):** An annotated catalogue of the Iranian Pteromalidae (Hymenoptera: Chalcidoidea). *Entomofauna* (Supplement), 19: 1–101.
- Ghahari, H.; Gibson, G.A.P. and Viggiani, G. (2021):** Introduction, pp. 3–13. In: Ghahari, H., Gibson, G.A.P. and Viggiani, G. (eds.), *Chalcidoidea of Iran* (Insecta: Hymenoptera). CABI, Wallingford, pp. 432.
- Gibson, G.A.P., Dzhankmen, K.A., van Noort, S., Ghahari, H. and Doğanlar, M. (2021):** Family Pteromalidae Dalman, 1820, pp. 295–353. In: Ghahari, H., Gibson, G.A.P. and Viggiani, G. (eds.) *Chalcidoidea of Iran* (Insecta: Hymenoptera). CABI, Wallingford, pp. 432.
- Goulet, H. and Huber, J.T. (1993):** Hymenoptera of the World: An Identification Guide to Families. Ottawa, Ontario, Research Branch Agriculture Canada, pp. 660.
- Lotfalizadeh H.; Karimpour Y.; Delvare G. and Rasplus J. Y. (2020):** Chalcidoidea (Hymenoptera) obtained from common reed, *Phragmites australis* (Cav.) Trin. ex Steud. (Poaceae) in Iran with new records and descriptions of two new species. *European Journal of Taxonomy*, 710: 1–35.
- Noyes, J. (2022):** Universal Chalcidoidea Database. World Wide Web electronic publication. Available from: <http://www.nhm.ac.uk/chalcidoids> (Accessed 30 January 2022)
- Rahmani, Z.; Rakhshani, E.; Lotfalizadeh, H. and Mokhtari, A. (2020a):** First occurrence of the genus *Harrizia* Delucchi, 1962 (Hymenoptera: Pteromalidae) in the border of East Palearctic. *Journal of Crop Protection*, 9: 149–155.
- Rahmani, Z.; Rakhshani, E.; Lotfalizadeh, H. and Mokhtari, A. (2020b):** First records of the genera *Psilocera* Walker, 1833 and *Stinoplus* Thomson, 1878 (Hymenoptera, Pteromalidae) in Iran. *Journal of Insect Biodiversity and Systematics*, 6(3): 213–221.
- Rahmani, Z.; Rakhshani, E.; Lotfalizadeh, H.; Mokhtari, A. and Mitroiu, M. D. (2021):** The subfamily Pteromalinae (Chalcidoidea: Pteromalidae) in South-Eastern Iran. *Opuscula Zoologica*, 52(2): 183–197.
- Rahmani, Z.; Rakhshani, E.; Lotfalizadeh, H. and Mokhtari, A. (2022):** Annotated checklist of Pteromalidae (Hymenoptera, Chalcidoidea) in the Middle East and North Africa. *Journal of Insect Biodiversity and Systematics*, 8(2): 265–377.
- Sakenin, H.; Eslami, B.; Samin, N.; Imani, S.; Shirdel, F. and Havaskary, M. (2008a):** A contribution to the most important trees and shrubs as the hosts of wood-boring beetles in different regions of Iran and identification of many natural enemies. *Journal of Plant and Ecosystem*, 16: 27–46.
- Sakenin, H.; Imani, S.; Shirdel, F.; Samin, N. and Havaskary, M. (2008b):** Identification of Pentatomidae (Heteroptera) and their host plants in central and eastern Mazandaran province and introducing of many dominant natural enemies. *Journal of Plant and Ecosystem*, 15: 37–51.
- Sakenin, H.; Samin, N.; Trjapitzin, V.A.; Dzhankmen, K.A.; Prinsloo, G.L. and Abd-Rabou, S. (2019):** A faunistic study on Chalcidoidea (Hymenoptera) of Iran. *Calodema*, 733: 1–5.
- Shojaey, M.; Khayrandish, M.; Madjzadeh, S.M. and Lotfalizadeh, H. (2020):** A faunistic study of Miscogastrinae, Ormocerinae and Spalangiinae (Chalcidoidea: Pteromalidae) in south of Kerman province with a new generic record from Iran. *Journal of Insect Biodiversity and Systematics*, 6: 167–177.
- Shojaey, M.; Khayrandish, M.; Madjzadeh, S.M. and Lotfalizadeh, H. (2021):** New records of Pteromalinae (Hymenoptera: Chalcidoidea, Pteromalidae) from Iran. *Far Eastern Entomologist*, 439: 14–23.
- Taher, H.; Vafaei Shoushtari, R.; Lotfalizadeh, H. and Gholdasteh, S. (2022):** Review of the genus *Mesopolobus* Westwood (Hymenoptera: Pteromalidae) in Iran with a new record. *Journal of Crop Protection*, 11(1): 85–92.

Viggiani, G.; Hayat, M.; Myartseva, S.N.; Ghahari, H.; Abd-Rabou, S. and Huang, J. (2021): Family Aphelinidae Thomson, 1876, pp. 20–85. In: Ghahari, H., Gibson, G.A.P. and Viggiani, G. (eds.), Chalcidoidea of Iran (Insecta: Hymenoptera). CABI, Wallingdord, pp.432.

Appendix 1. Pteromalidae species that occur in Iran (New records are marked with an asterisk (*)) [Adapted from Gibson *et al.* 2021 + new published records and two new country records]

- 1) *Ablaxia anaxenor* (Walker, 1845)
- 2) *A. parviclava* (Thomson, 1878)
- 3) *Acrocormus semifasciatus* Thomson, 1878
- 4) *Agrilocida ferrieri* Steffan, 1964
- 5) *Anisopteromalus calandrae* (Howard, 1881)
- 6) *Anognmus hohenheimensis* (Ratzeburg, 1844)
- 7) *A. laricis* (Bouček, 1966)
- 8) *Apocrypta longitarsus* Mayr, 1906
- 9) *Apsilocera bramleyi* Graham, 1966
- 10) *Arthrolytus discoideus* (Nees, 1834)
- 11) *A. ocellus* (Walker, 1834)
- 12) *Asaphes suspensus* (Nees, 1834)
- 13) *A. vulgaris* Walker, 1834
- 14) *Bairamliia fuscipes* Waterston, 1929
- 15) *Blascoa ephedrae* Askew, 1997
- 16) *Caenacis inflexa* (Ratzeburg, 1848)
- 17) *C. lauta* (Walker, 1835)
- 18) *Caenocrepis arenicola* (Thomson, 1878)
- 19) *C. bothynoderi* Gromakov, 1940
- 20) *Callitula angioneuræ* Bouček, 1970
- 21) *C. bicolor* Spinola, 1811
- 22) *C. ferrieri* (Bouček, 1964)
- 23) *Callocleonimus pulcher* Masi, 1940
- 24) *Capellia cecidomyiae* (Ratzeburg, 1844)
- 25) *Catolaccus ater* (Ratzeburg, 1852)
- 26) *C. crassiceps* (Masi, 1911)
- 27) *Cecidostiba fungosa* (Geoffroy, 1785)
- 28) *C. semifascia* (Walker, 1835)
- 29) *Cerocephala cornigera* Westwood, 1832
- 30) *C. rufa* (Walker, 1833)
- 31) *Chalcedectus balachowskyi* Steffan, 1968
- 32) *C. sinaiticus* (Masi, 1936)
- 33) *Cheiropachus quadrum* (Fabricius, 1787)
- 34) *Chlorocyttus breviscapus* Graham, 1965
- 35) *C. diversus* (Walker, 1836)
- 36) *C. spicatus* (Walker, 1835)
- 37) *Cleonimus laticornis* Walker, 1837
- 38) *C. narendrani* Samin & Sureshan, 2018
- 39) *Coelopisthia areolata* Askew, 1980
- 40) *C. extenta* (Walker, 1835)
- 41) *C. pachycera* Masi, 1924
- 42) *Colotrechnus subcoeruleus* Thomson, 1878
- 43) *C. viridis* (Masi, 1921)
- 44) *Conomorium amplum* (Walker, 1835)
- 45) *C. patulum* (Walker, 1835)
- 46) *Coruna clavata* Walker, 1833
- 47) *Cratomus megacephalus* (Fabricius, 1793)
- 48) *Cyrtogaster britteni* Askew, 1965
- 49) *C. clavicornis* Walker, 1833
- 50) *C. vulgaris* Walker, 1833
- 51) *Cyrtoptyx latipes* (Rondani, 1874)
- 52) *C. lichtensteini* (Masi, 1922)
- 53) *C. pistaciae* (Nikol'skaya, 1935)
- 54) *C. robustus* (Masi, 1907)
- 55) *Dibrachoides dynastes* (Förster, 1841)
- 56) *Dibrachys affinis* Masi, 1907
- 57) *D. lignicola* Graham, 1969
- 58) *D. microgastri* (Bouché, 1834)
- 59) *Diglochis sylvicola* (Walker, 1835)
- 60) *Dinarmoides spilopterus* Masi, 1924
- 61) *Dinarmus acutus* (Thomson, 1878)
- 62) *D. altifrons* (Walker, 1862)
- 63) *D. basalis* (Rondani, 1877)
- 64) *D. italicus* (Masi, 1922)
- 65) *D. vagabundus* (Timberlake, 1926)
- 66) *Dinotiscus aponius* (Walker, 1848)
- 67) *D. colon* (Linnaeus, 1758)
- 68) *D. eupterus* (Walker, 1836)
- 69) *Dipara claviger* (Kieffer, 1906)*
- 70) *D. petiolata* Walker, 1833
- 71) *Erdoesina alboannulata* (Ratzeburg, 1852)
- 72) *Euneura lachni* (Ashmead, 1887)
- 73) *Eunotus areolatus* (Ratzeburg, 1852)
- 74) *E. acutus* Kurdjumov, 1912
- 75) *E. nigriclavus* (Förster, 1856)
- 76) *Eurydinota leptomera* Förster, 1878
- 77) *Gastracanthus pulcherrimus* Westwood, 1833
- 78) *Gastrancistrus ephedrae* Dzhankmen, 1994
- 79) *Goidanichium atrum* Bouček, 1970
- 80) *Gugolzia bademia* Doğanlar, 2004
- 81) *G. harmolitae* Delucchi & Steffan, 1956
- 82) *Gyrinophagus aper* (Walker, 1839)
- 83) *G. luteipes* Ruschka, 1914
- 84) *Habritys brevicornis* (Ratzeburg, 1844)
- 85) *Halticoptera aenea* (Walker, 1833)
- 86) *H. andriescui* Mitroiu, 2005
- 87) *H. circulus* (Walker, 1833)
- 88) *H. collaris* (Walker, 1836)
- 89) *H. crius* (Walker, 1839)
- 90) *H. flavicornis* (Spinola, 1808)
- 91) *H. laevigata* Thomson, 1876
- 92) *H. longipetiolus* Hedqvist, 1975
- 93) *H. moczari* (Erdős, 1954)
- 94) *H. patellana* (Dalman, 1818)
- 95) *H. polita* Walker, 1834
- 96) *H. triannulata* (Erdős, 1946) *
- 97) *H. violacea* Askew, 1972
- 98) *H. yoncacus* Doğanlar, 2006
- 99) *Harrizia mira* Delucchi, 1962
- 100) *Hemitrichus seniculus* (Nees, 1834)
- 101) *Heydenia pretiosa* Förster, 1856
- 102) *Hobbya stenonota* (Ratzeburg, 1848)
- 103) *Holcaeus calligetis* (Walker, 1839)
- 104) *Homoporus apharetus* (Walker, 1839)
- 105) *H. destructor* (Say, 1817)
- 106) *H. febriculosus* (Girault, 1917)
- 107) *H. fulviventris* (Walker, 1835)
- 108) *H. laeviusculus* Erdős, 1953
- 109) *H. luniger* (Nees, 1834)
- 110) *H. pulchripes* Erdős, 1953
- 111) *H. semiluteus* (Walker, 1872)
- 112) *H. subniger* (Walker, 1835)
- 113) *Hyperimerus pusillus* (Walker, 1833)
- 114) *Ischyroptyx ligusticus* (Masi, 1922)

- 115) *Ksenoplata quadrata* Bouček, 1965
116) *Lariophagus distinguendus* (Förster, 1841)
117) *Macroglenes varicornis* (Haliday, 1833)
118) *Macromesemus amphiretus* Walker, 1848
119) *Meraporus graminicola* Walker, 1834
120) *Merisus splendidus* Walker, 1834
121) *Mesopeltita truncatipennis* (Waterston, 1917)
122) *Mesopolobus aequus* (Walker, 1834)
123) *M. albitarsus* (Walker, 1834)
124) *M. amaenus* (Walker, 1834)
125) *M. aspilus* (Walker, 1835)
126) *M. deserti* Dzhankokmen, 1994
127) *M. diffinis* (Walker, 1834)
128) *M. fasciiventris* Westwood, 1833
129) *M. graminum* (Hardh, 1950)
130) *M. incultus* (Walker, 1834)
131) *M. juniperinus* Rosen, 1958
132) *M. laticornis* (Walker, 1834)
133) *M. mediterraneus* (Mayr, 1903)
134) *M. morys* (Walker, 1848)
135) *M. nobilis* (Walker, 1834)
136) *M. sericeus* (Förster, 1770)
137) *M. subfumatus* (Ratzeburg, 1852)
138) *M. teliformis* (Walker, 1834)
139) *M. tibialis* (Westwood, 1833)
140) *M. typographi* (Ruschka, 1924)
141) *M. xanthocerus* (Thomson, 1878)
142) *Metacolus azureus* (Ratzeburg, 1844)
143) *M. unifasciatus* Förster, 1856
144) *Metastenus concinnus* Walker, 1834
145) *Miscogaster elegans* Walker, 1833
146) *M. hortensis* Walker, 1833
147) *M. maculata* Walker, 1833
148) *M. rufipes* Walker, 1833
149) *Mokrzeckia menzeli* Subba Rao, 1981
150) *M. obscura* Graham, 1969
151) *M. pini* (Hartig, 1838)
152) *Moranila californica* (Howard, 1881)
153) *Muscidifurax raptor* Girault & Sanders, 1910
154) *Nasonia vitripennis* (Walker, 1836)
155) *Nikolskayana mirabilis* Bouček, 1965
156) *Norbanus arcuatus* Xiao & Huang, 2001
157) *N. brevicornis* Szelenyi, 1974
158) *N. calabrus* (Masi, 1924)
159) *N. cerasiops* (Masi, 1922)
160) *N. meridionalis* (Masi, 1922)
161) *N. obscurus* (Masi, 1922)
162) *N. persicus* Lotfalizadeh & Rasplus, 2020
163) *N. rasplusi* Lotfalizadeh, 2015
164) *N. scabriculus* (Nees, 1834)
165) *Notanisus clavatus* Bouček, 1961
166) *N. oulmesiensis* (Delucchi, 1962)
167) *N. sexramosus* (Erdős, 1946)
168) *N. vanharteni* Gibson, 2015
169) *N. versicolor* Walker, 1837
170) *Notoglyptus scutellaris* (Dodd & Girault, 1915)
171) *Novitzkyanus cryptogaster* Bouček, 1961
172) *Oodera formosa* (Girault, 1863)
173) *Ormocerus vernalis* Walker, 1834
174) *Pachycrepoideus vindemmiae* (Rondani, 1875)
175) *Pachyneuron aphidis* (Bouché, 1834)
176) *P. bonum* Xu & Li, 1991
177) *P. erzurumicum* Doğanlar, 1986
178) *P. formosum* Walker, 1833
179) *P. gibbiscuta* Thomson, 1878
180) *P. grande* Thomson, 1878
181) *P. groenlandicum* (Holmgren, 1872)
182) *P. leucopiscida* Mani, 1939
183) *P. muscarum* (Linnaeus, 1758)
184) *P. nelsoni* Girault, 1928
185) *P. planiscuta* Thomson, 1878
186) *P. solitarium* (Hartig, 1838)
187) *P. tonyi* Narendran & Santhosh, 2007
188) *Panstenon oxylus* (Walker, 1839)
189) *Paracarotomus cephalotes* Ashmead, 1894
190) *Peridesmia discus* (Walker, 1835)
191) *Phaenocythus glechomae* (Förster, 1841)
192) *Philotrypesis caricae* (Linnaeus, 1762)
193) *P. pilosa* Mayr, 1906
194) *Platecrizotes europaeus* Bouček, 1964
195) *Plutothrix trifasciata* (Thomson, 1878)
196) *Pseudocatolaccus aragonensis* Askew, 2001
197) *P. nitescens* (Walker, 1834)
198) *Psilocera obscura* Walker, 1833
199) *P. achaeus* Walker, 1848
200) *P. adamas* Walker, 1834
201) *Psychophagus omnivorus* (Walker, 1835)
202) *Pteromalus albipennis* Walker, 1835
203) *P. sapum* (Retzius, 1783)
204) *P. bedeguaris* (Thompson, 1878)
205) *P. bifoveolatus* Förster, 1861
206) *P. cardui* (Erdős, 1953)
207) *P. chlorospilus* (Walker, 1834)
208) *P. chrysos* Walker, 1836
209) *P. cyniphidis* (Linnaeus, 1758)
210) *P. dolichurus* (Thomson, 1878)
211) *P. elevatus* (Walker, 1834)
212) *P. intermedius* (Walker, 1834)
213) *P. microps* (Graham, 1969)
214) *P. puparum* (Linnaeus, 1758)
215) *P. semotus* (Walker, 1834)
216) *P. sequester* Walker, 1835
217) *P. smaragdus* Graham, 1969
218) *P. varians* (Spinola, 1808)
219) *P. veneris* Dalla Torre, 1898
220) *Rhaphitelus ladenbergi* (Ratzeburg, 1844)
221) *R. maculatus* Walker, 1834
222) *Rhicoecoelia impar* (Walker, 1836)
223) *Rhopalicus quadratus* (Ratzeburg, 1844)
224) *R. tutela* (Walker, 1836)
225) *Sceptrothelys intermedia* Graham, 1969
226) *Schizonotus latus* (Walker, 1835)
227) *S. sieboldi* (Ratzeburg, 1848)
228) *Scutellista caerulea* (Fonscolombe, 1832)
229) *S. obscura* (Förster, 1878)
230) *Seladerma geniculatum* (Zetterstedt, 1838)
231) *Solenura ania* (Walker, 1846)
232) *S. nigra* (Walker, 1872)
233) *Spalangia cameroni* Perkins, 1910
234) *S. drosophilae* Ashmead, 1887
235) *S. endius* Walker, 1839
236) *S. erythromera* Förster, 1850
237) *S. fuscipes* Nees, 1834
238) *S. nigra* Latreille, 1805
239) *S. nigripes* Curtis, 1839
240) *S. nigroaenea* Curtis, 1839
241) *S. arugulosa* Förster, 1850

- 242) *S. subpunctata* Förster, 1850
 243) *S. dissimilis* Walker, 1833
 244) *S. polyspilus* Graham, 1956
 245) *S. hofferi* Bouček, 1964
 246) ***Sphegigaster brevicornis*** (Walker, 1833)
 247) *S. cuscutae* Ferrière, 1959
 248) *S. ineus* Mitroiu, 2008
 249) *S. mutica* Thomson, 1878
 250) *S. nigricornis* (Nees, 1834)
 251) *S. orobanchiae* Kurdjumov, 1912
 252) *S. pallicornis* (Spinola, 1808)
 253) *S. pedunculiventris* (Spinola, 1808)
 254) *S. persiana* Mitroiu & Madjzadeh, 2011
 255) *S. stepicola* Bouček, 1965
 256) *S. truncata* Thomson, 1878
 257) ***Spintherus dubius*** (Nees, 1834)
 258) ***Stenetra ligustica*** Masi, 1931
 259) ***Stenomalina delvarei*** Lotfalizadeh & Rasplus, 2020
 260) *S. favorinus* (Walker, 1839)
 261) *S. gracilis* (Walker, 1834)
 262) *S. iera* (Walker, 1844)
 263) ***Stenoselma nigrum*** Delucchi, 1956
 264) ***Stinoplus etearchus*** (Walker, 1848)
 265) ***Sycophaga gigas*** (Mayr, 1906)
 266) *S. sycomori* (Linnaeus, 1758)
 267) ***Syntomopus incisus*** Thomson, 1878
 268) *S. incurvus* Walker, 1833
 269) ***Systasis angustula*** Graham, 1969
 270) *S. annulipes* (Walker, 1834)
 271) *S. ephedrae* Dzhankmen, 1982
 272) *S. encyrtoides* Walker, 1854
 273) *S. longula* Bouček, 1956
 274) *S. parvula* Thomson, 1876
 275) *S. tenuicornis* Walker, 1834
 276) ***Thektogaster chrysis*** (Förster, 1861)
 277) ***Theocolax elegans*** (Westwood, 1874)
 278) *T. formiciformis* Westwood, 1832
 279) ***Thinodytes cyzicus*** (Walker, 1839)
 280) ***Tomicobia seitheri*** (Ruschka, 1924)
 281) ***Toxeuma fuscicorne*** Walker, 1833
 282) ***Trichomalopsis hemiptera*** (Walker, 1835)
 283) *T. microptera* (Lindeman, 1887)
 284) *T. peregrina* (Graham, 1969)
 285) ***Trichomalus nanus*** (Walker, 1836)
 286) *T. campestris* (Walker, 1834)
 287) *T. perfectus* (Walker, 1835)
 288) *T. posticus* (Walker, 1834)
 289) *T. rufinus* (Walker, 1835)
 290) ***Trigonoderus pulcher*** Walker, 1836
 291) ***Tritneptis affinis*** (Nees, 1834)
 292) *T. klugii* (Ratzeburg, 1844)
 293) ***Trychnosoma punctipleura*** (Thomson, 1878)
 294) ***Urolepis maritima*** (Walker, 1834)
 295) ***Xestomnaster chrysochlorus*** (Walker, 1846)