



New knowledges about Chalcidoid wasps (Hymenoptera: Chalcidoidea) from Bingöl province and an updated list of Eurytomidae, Ormyridae and Perilampidae of Türkiye

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Abstract. This study was conducted to collect Chalcidoidea in Bingöl province in eastern Türkiye between 2019 and 2023. Four additional records were found in three families within the superfamily Chalcidoidea: *Eurytoma rosae* Nees, 1834 (Eurytomidae); *Ormyrus graciosus* (Förster, 1860) and *O. orientalis* Walker, 1871 (Ormyridae) and *Perilampus ruficornis* (Fabricius, 1793) (Perilampidae). Furthermore, distribution maps, collecting locations, and images of the species that have been documented were provided. Finally, a revised checklist is given for Turkish Eurytomidae, Ormyridae, and Perilampidae.

Keywords: Chalcidoidea, additional records, new locations, checklist, Türkiye

Article History

Received:
13 June 2024

Accepted:
21 August 2024

Subject Editor:
Mar-Ferrer Suay

Citation: Kaplan, E. & Lotfalizadeh, H. (2024) New knowledges about Chalcidoid wasps (Hymenoptera: Chalcidoidea) from Bingöl province and an updated list of Eurytomidae, Ormyridae and Perilampidae of Türkiye. *J. Entomol. Soc. Iran*, 44 (4), 487–497.

Introduction

Chalcidoidea is a hymenopteran superfamily with the most species diversity (Heraty *et al.*, 2013; UCD Community, 2023). The species of the families Eurytomidae, Ormyridae, and Perilampidae, gall-associated chalcidoids, are widely distributed in Türkiye and the world. One of the well-known families within Chalcidoidea is Eurytomidae, the larvae of which mostly feed on seeds, produce galls, or parasitize phytophagous insects (Lotfalizadeh *et al.*, 2007a, b). There are currently 84 genera and 1424 species in the family Eurytomidae, divided into three subfamilies globally (UCD Community, 2023; Lotfalizadeh *et al.*, 2024). Nowadays, the fauna of Eurytomidae in Türkiye consists of 101 species across 10 genera (UCD Community, 2023). The family Ormyridae are mostly solitary, larval, primary or occasionally secondary ectoparasitoids of gall-inducing insects and also parasitoids of phytophagous Eurytomidae (Chalcidoidea) in seeds (Gibson *et al.*, 1997, Lotfalizadeh *et al.*, 2012). There are 153 species and six genera in this family that have been described worldwide. Türkiye's Ormyridae fauna comprises 12 species in one genus (UCD Community, 2023). Within the superfamily Chalcidoidea, the family Perilampidae are primarily composed of hyperparasitoid species (Anonymous, 2024). There are 224 species and eight genera in the family Perilampidae worldwide, of which only one genus consisting of six species of the perilampids was documented for Türkiye (UCD Community, 2023). By adding new data and revising their checklists, our current study seeks to add new findings to the fauna of the families Eurytomidae, Ormyridae, and Perilampidae of Türkiye.

Materials and methods

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The material was collected using a sweep net at numerous sites in mountainous and forested areas with many diverse plant species in Bingöl province between 2019 and 2023 (Fig. 1). Photographs of all species were taken with a Nikon SMZ745T stereomicroscope. The distribution and occurrence of species in Türkiye are based on UCD Community (2023). We used the following papers to identify every species: Nikol'skaya (1952), Peck *et al.* (1964), Ferrière (1950), and Szelényi (1976a, b) (Eurytomidae); Nikol'skaya (1952) and Doğanlar (1991) (Ormyridae); Ferrière & Kerrich (1958) and Bouček (1956, 1978) (Perilampidae). Taxonomic classification and nomenclature follow UCD Community (2023). The first author's collection at the Department of Plant Protection, Faculty of Agriculture, Bingöl University, (Bingöl, Türkiye) contains the specimens.

Results

Characterization of Chalcidoidea

Family: Eurytomidae Walker, 1832

Subfamily: Eurytominae Walker, 1832

Genus: *Eurytoma* Illiger, 1807

Eurytoma rosae Nees, 1834 (Fig. 2)

Material examined. Bingöl, Altınışık, 38° 49' 41.45" N, 40° 28' 35.65" E, 1517 m, 12.VI.2023, 1♀; Karlıova, Sarıkuşak, 39° 23' 27.29" N, 40° 50' 01.10" E, 1833 m, 01.VI.2019, 1♀; Solhan, Yenidal, 38° 54' 38.51" N, 40° 55' 42.87" E, 1210 m, 26.V.2019, 1♂, (leg. E. Kaplan).

Distribution in Türkiye. Anatolia, Ankara, Erzurum, Sivas and Tokat (Nicol'skaya, 1952; Kılınçer, 1983; Doğanlar, 1984, 1990; Çam, 1994; Bayram *et al.*, 1998; Özbek *et al.*, 1999; Gençer, 2003).

Global distribution. Andorra, Argentina, Armenia, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Caucasus, Central Asia, Czech Republic, former Czechoslovakia, Denmark, Europe, Finland, France, Corsica, Germany, Greece, Hungary, Iran, Italy, Kazakhstan, Malaysia, Netherlands, North Africa, Republic of China, Poland, Romania, Serbia, Slovakia, Spain, Sweden, Switzerland, Türkiye, United Kingdom (England), former Yugoslavia (pre 1991) (UCD Community, 2023).

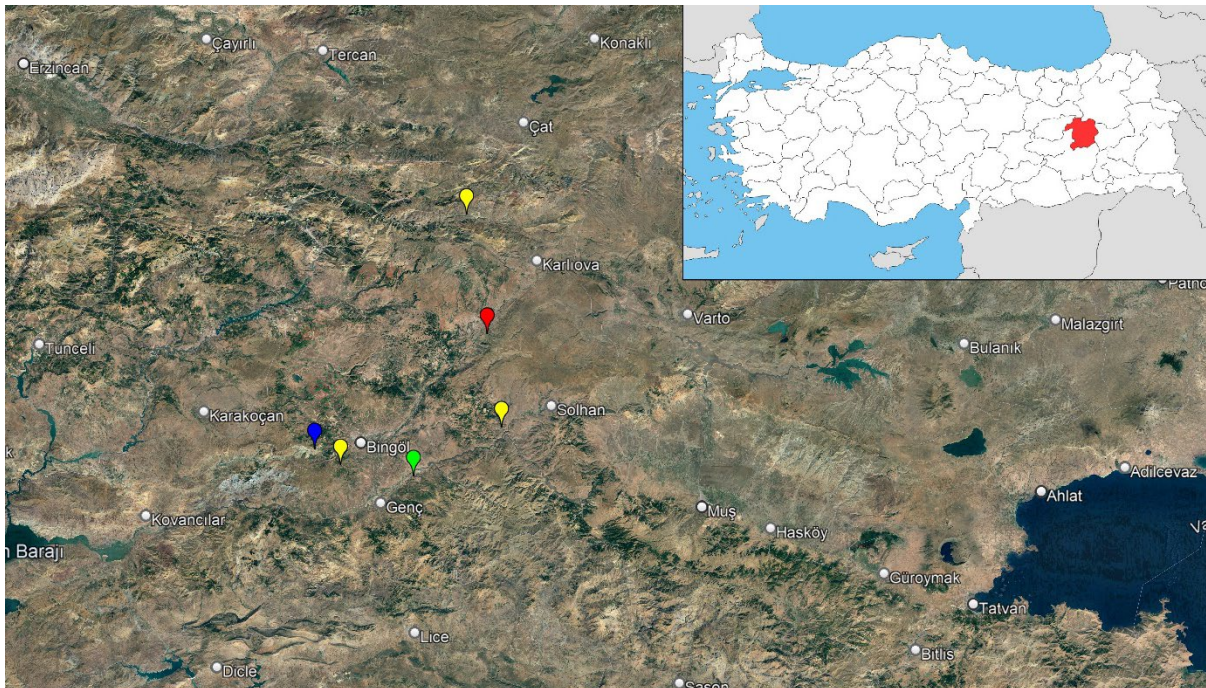


Fig. 1. Map showing where species of *Eurytoma rosae* Nees, 1834 (Yellow), *Ormyrus gratiosus* (Förster, 1860) (Red), *Ormyrus orientalis* Walker, 1871 (Green), *Perilampus ruficornis* (Fabricius, 1793) (Blue) were collected from eastern Türkiye.

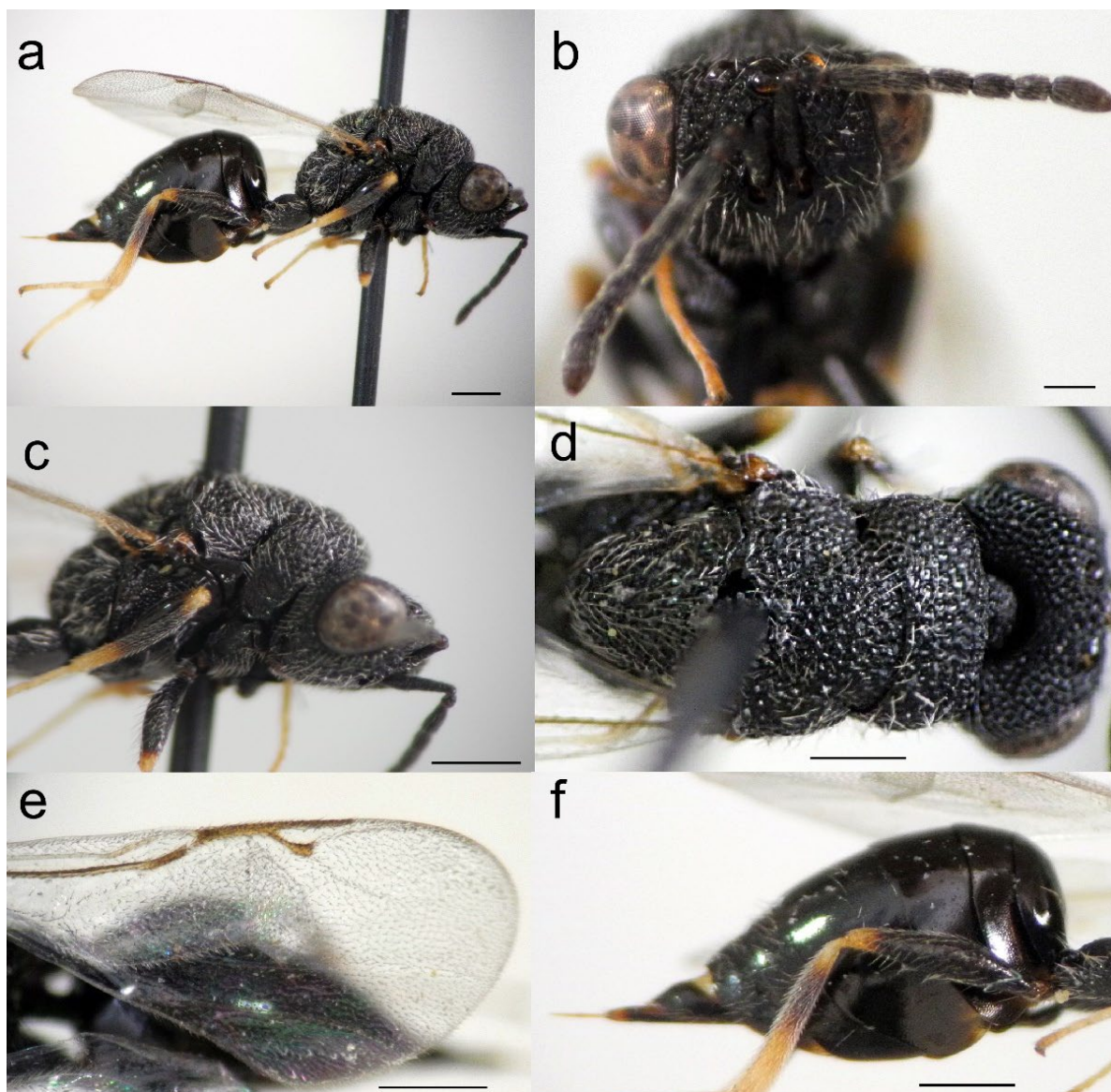


Fig. 2. *Eurytoma rosae* Nees, 1834: female; a) lateral view of habitus; b) frontal view of head; c) lateral view of mesosoma; d) dorsal view of mesosoma; e) fore wing; f) lateral view of metasoma. Scale bars: 0.3 mm.

Family: Ormyridae Förster, 1856

Subfamily: Ormyrinae Förster, 1856

Genus: *Ormyrus* Westwood, 1832

Ormyrus gratiosus (Förster, 1860) (Fig. 3)

Material examined. Bingöl, Karlıova, Göynük Bucağı, 39° 08' 00.03" N, 40° 52' 54.97" E, 1823 m, 31.V.2019, 1♀, (leg. E. Kaplan).

Distribution in Türkiye. Erzurum (Doğanlar, 1984).

Global distribution. Armenia, Austria, Bulgaria, Caucasus, Czech Republic, Europe, Finland, France, Georgia, Germany, Hungary, Iran, Kazakhstan, Macedonia, Netherlands, Poland, Russia (Astrakhan' Oblast, Kursk Oblast, Lipetsk Oblast, Moscow Oblast, Voronezh Oblast), Serbia, Slovakia, Spain, Sweden, Switzerland, Türkiye, Turkmenistan, Ukraine, United Kingdom, (England), former USSR, Uzbekistan (UCD Community, 2023).

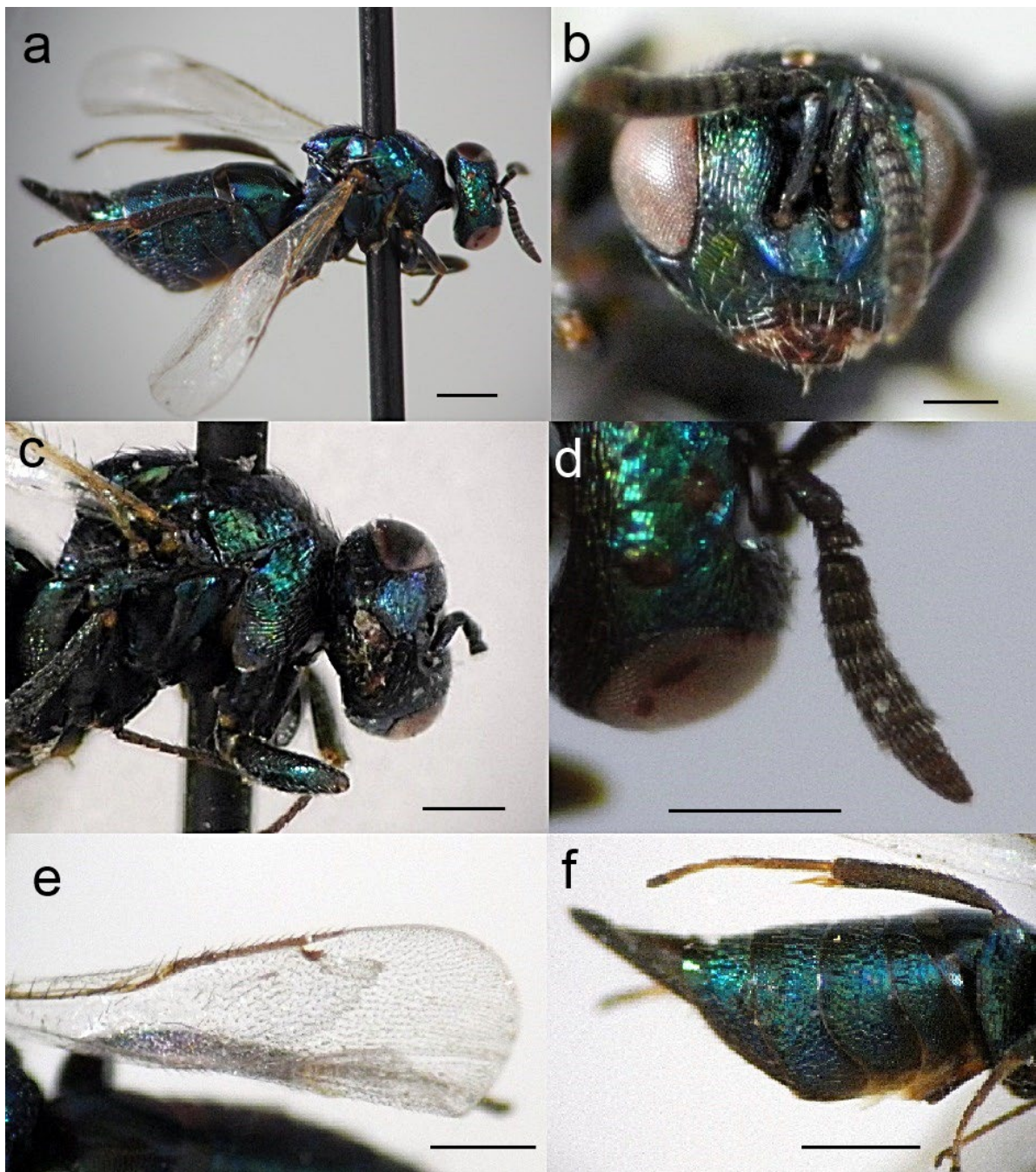


Fig. 3. *Ormyrus gratiosus* (Förster, 1860): female; a) lateral view of habitus; b) frontal view of head; c) lateral view of mesosoma; d) dorsal view of head and antenna; e) fore wing; f) lateral view of metasoma. Scale bars: 0.5 mm.

***Ormyrus orientalis* Walker, 1871 (Fig. 4)**

Material examined. Bingöl, Genç, Tavus, 38° 48' 08.64" N, 40° 58' 08.43" E, 1893 m, 25.V.2019, 1♀ (leg. E. Kaplan).

Distribution in Türkiye. Sivas (Gençer, 2014).

Global distribution. Afghanistan, Bulgaria, Caucasus, Croatia, Czech Republic, Dagestan, Dominican Republic, ESP-00 (Canary Is. aggregation), Europe, France, Germany, Greece, Hungary, India, Iran, Iraq, Italy, Macedonia, Moldova, Montenegro, Nakhichevan, Pakistan, Russia (Voronezh, Zhytomyr), Serbia, Slovakia, Spain, Sri Lanka, Türkiye (UCD Community, 2023).

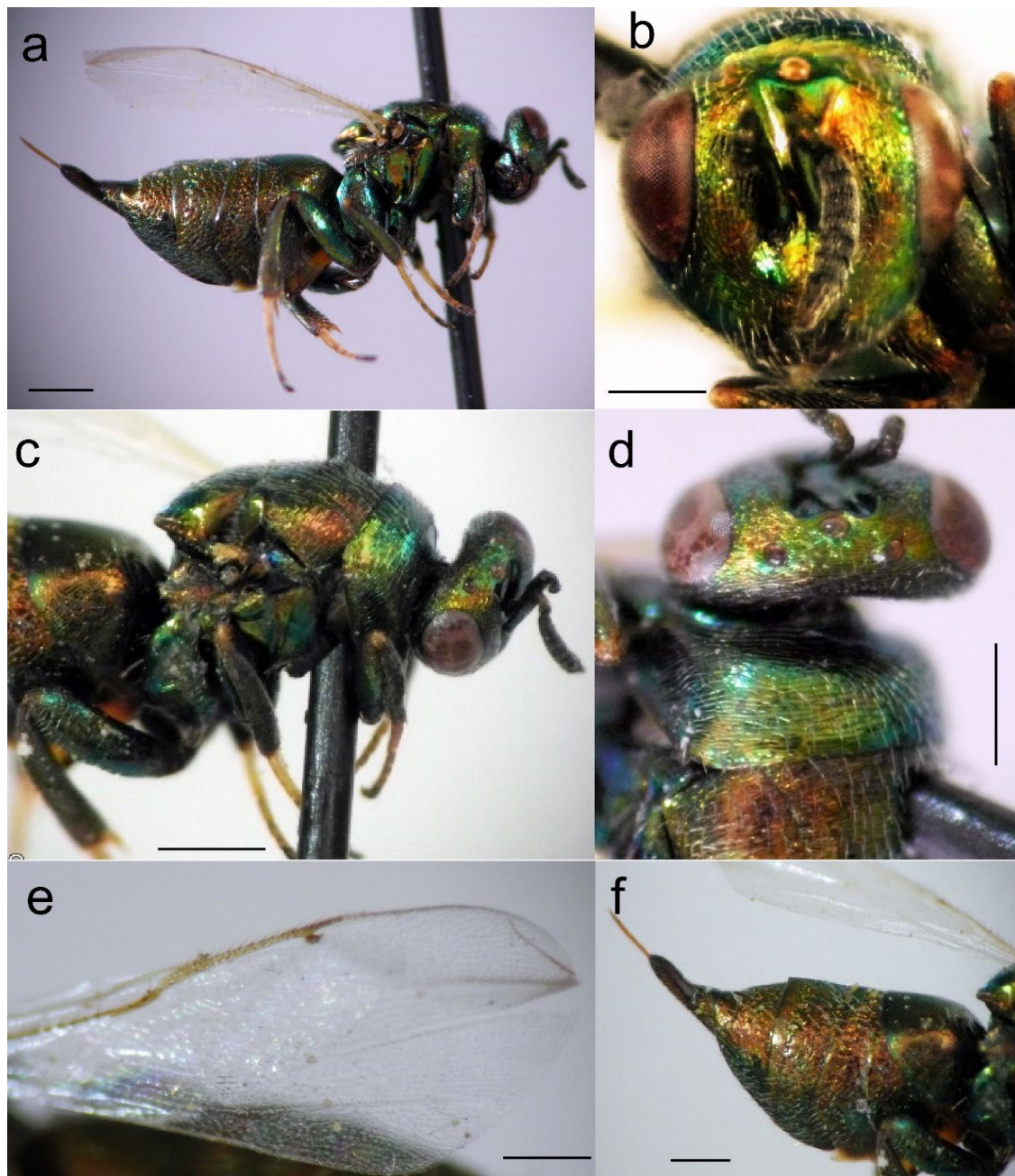


Fig. 4. *Ormyrus orientalis* Walker, 1871: female; a) lateral view of habitus; b) frontal view of head; c) lateral view of mesosoma; d) dorsal view of mesosoma; e) fore wing; f) lateral view of metasoma. Scale bars: 0.5 mm.

Family: Perilampidae Förster, 1856

Subfamily: Perilampinae Förster, 1856

Genus: *Perilampus* Latreille, 1809

Perilampus ruficornis (Fabricius, 1793) (Fig. 5)

Material examined. Bingöl, Çiriş, 38° 52' 52.65" N, 40° 22' 00.65" E, 1773 m, 15.VI.2023, 1♂ (leg. E. Kaplan).

Distribution in Türkiye. Artvin (Mitroiu & Koutsoukos, 2023).

Global distribution. Austria, Bulgaria, Canada, Croatia, Czech Republic, Europe, France, Germany, Greece, Hungary, Italy, Japan, Lithuania, Netherlands, Nigeria, Russia (Adygey, Bashkortostan, Kursk, Volgograd, Voronezh, Zhytomyr), Serbia, Slovakia, South Korea, Sweden, Türkiye, United Kingdom (UCD Community, 2023).

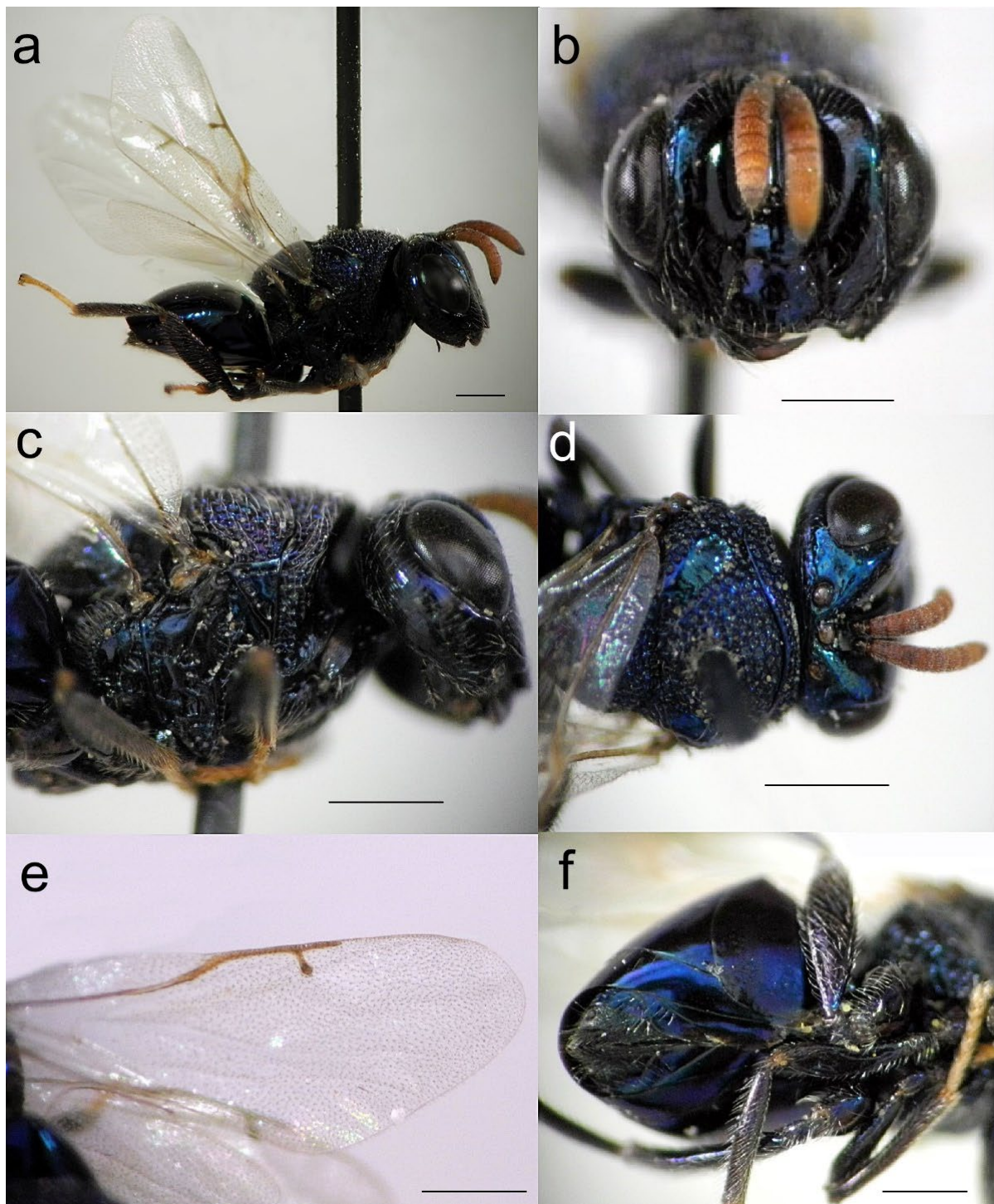


Fig. 5. *Perilampus ruficornis* (Fabricius, 1793): male; a) lateral view of habitus; b) frontal view of head; c) lateral view of mesosoma; d) dorsal view of mesosoma; e) fore wing; f) ventral view of metasoma. Scale bars: 0.5 mm.

The updated checklists for Turkish Eurytomidae, Ormyridae and Perilampidae families

Family: Eurytomidae Walker, 1832

Genus: *Aximopsis* Ashmead, 1904

Species: *Aximopsis augasmae* (Zerova, 1977); *A. collina* (Zerova, 1984); *A. nodularis* (Boheman, 1836).

Genus: *Bruchophagus* Ashmead, 1888

Species: *Bruchophagus astragali* Fedoseeva, 1954; *B. bajariae* (Erdös, 1957); *B. coluteae* (Bouček, 1954); *B. coronillae* Erdélyi & Szelényi, 1975; *B. gibbus* (Boheman, 1836); *B. mutabilis* Nikol'skaya, 1952; *B. platyptera* (Walker, 1834); *B. robiniae* Zerova, 1970; *B. roddi* Gussakovskiy, 1933; *B. verbasci* (Erdös, 1969).

Genus: *Eurytoma* Illiger, 1807

Species: *Eurytoma adleriae* Zerova, 1995; *E. aemula* Szelényi, 1974; *E. amygdali* Enderlein, 1907; *E. appendigaster* (Swederus, 1795); *E. aspilus* (Walker, 1836); *E. brevicoxa* Zerova and Çam, 2003; *E. bruniventris* Ratzeburg, 1952; *E. centaureae* Claridge, 1960; *E. collaris* Walker, 1832; *E. compressa* (Fabricius, 1794); *E. crambeae* Zerova, 1978; *E. curculionum* Mayr, 1878; *E. curta* Walker, 1832; *E. cypriaca* Masi, 1934; *E. dentata* Mayr, 1878; *E. erdoesi* Szelényi, 1974; *E. flavimana* Boheman, 1836; *E. goidanichi* Bouček, 1970; *E. harmolitarum* Erdös, 1957; *E. herbaria* Zerova, 1994; *E. infracta* Mayr, 1904; *E. koeleriae* Erdös, 1969; *E. laserpitii* Mayr, 1878; *E. lobopterae* Erdös, 1964; *E. martellii* Domenichini, 1960; *E. mayri* Ashmead, 1887; *E. morio* Boheman, 1836; *E. ochraceipes* Kalina, 1970; *E. onobrychidis* Nikol'skaya, 1933; *E. oophaga* Silvestri, 1920; *E. phalaridis* Graham, 1974; *E. pistaciae* Rondani, 1877; *E. plotnikovi* Nikol'skaya, 1934; *E. pollux* Claridge, 1959; *E. robusta* Mayr, 1878; *E. rosae* Nees, 1834; *E. rufipes* Walker, 1832; *E. schreineri* Schreiner, 1908; *E. serratulae* (Fabricius, 1798); *E. strigifrons* Thomson, 1876; *E. striolata* Ratzeburg, 1848; *E. terebinthi* Rondani, 1877; *E. tokatensis* Doğanlar and Çam, 1991; *E. turkezia* Zerova and Çam, 2003; *E. verticillata* (Fabricius, 1798).

Genus: *Exeurytoma* Burks, 1971

Species: *Exeurytoma anatolica* Çam, 1998; *E. kebanensis* Doğanlar, 2005.

Genus: *Macrorileya* Ashmead, 1900

Species: *Macrorileya femorata* (Bouček, 1952); *M. inopinata* (Silvestri, 1920).

Genus: *Philachyra* Walker, 1871

Species: *Philachyra maderae* (Walker, 1849)

Genus: *Rileya* Ashmead, 1888

Species: *Rileya asiatica* Zerova, 1976; *R. doğanlari* Çam, 2003.

Genus: *Sycophila* Walker, 1871

Species: *Sycophila biguttatus* (Swederus, 1795); *S. flavicollis* (Walker, 1834); *S. iracemae* Nieves Aldrey, 1984; *S. kengerus* Doğanlar & Laz, 2022; *S. mayri* (Erdös, 1959); *S. mellea* (Curtis, 1831); *S. submutica* (Thomson, 1876); *S. variegata* (Curtis, 1831).

Genus: *Systole* Walker, 1832

Species: *Systole albipennis* Walker, 1832; *S. bipunctata* Erdös, 1952; *S. brunnicornis* Zerova and Çam, 2003; *S. conspicua* Erdös, 1951; *S. coriandri* Gussakovskiy, 1933; *S. minima* Zerova and Çam, 2003; *S. plana* Zerova and Çam, 2004; *S. salviae* Zerova, 1968; *S. tokata* Zerova and Çam, 2003.

Genus: *Tetramesa* Walker, 1848

Species: *Tetramesa agrostidis* (Howard, 1896); *T. anatolica* Zerova and Çam, 2003; *T. angustipenne* (Walker, 1832); *T. aptera* (Portschinsky, 1881); *T. brevicornis* (Walker, 1832); *T. brischkei* (Schlechtendal, 1891); *T. cereipes* (Erdös, 1955); *T. cornuta* (Walker, 1832); *T. crassicornis* (Walker, 1832); *T. elongia* Zerova, 2007; *T. eximia* (Giraud, 1863); *T. fulvicollis* (Walker, 1832); *T. fumipennis* (Walker, 1832); *T. giraudi* (Schlechtendal, 1891); *T. linearis* (Walker, 1832); *T. longula* (Dalman, 1820); *T. maderae* (Walker, 1849); *T. romana* (Walker, 1873); *T. tritici* (Fitch, 1859).

Family: Ormyridae Förster, 1856

Genus: *Ormyrus* Westwood, 1832

Species: *Ormyrus (Tribaeus) ardahanensis* (Doğanlar, 1991); *O. bingöliensis* Doğanlar, 1991; *O. diffinis* (Fonscolombe, 1832); *O. graciosus* (Förster, 1860); *O. kazovaensis* (Doğanlar, 1991); *O. longicornis* Bouček, 1969; *O. nitidulus* (Fabricius, 1804); *O. orientalis* Walker, 1871; *O. pomaceus* (Geoffroy, 1785); *O. tschami* (Doğanlar, 1991); *O. wachtlei* Mayr, 1904; *O. yeschilirmaka* (Doğanlar, 1991).

Family: Perilampidae Förster, 1856

Genus: *Perilampus* Latreille, 1809

Species: *Perilampus aeneus* (Rossius, 1790); *P. auratus* (Panzer, 1798); *P. cephalotes* Bouček, 1956; *P. italicus* (Fabricius, 1793); *P. ruficornis* (Fabricius, 1793); *P. tristis* Mayr, 1905.

Discussion

There are a great number of undiscovered species in the Chalcidoidea superfamily, which comprises over 500,000 species of diversity and about 22,500 nominated species (Heraty *et al.*, 2013). The majority of Chalcidoidea wasp species are employed as biological control agents in agricultural ecosystems, where they parasitize agricultural insect pests. Thus, it is necessary to survey the presence, diversity, and populations of these species in the natural ecosystems because they are crucial to preserving the natural balance of the environment. This study was conducted to extend our knowledge of Chalcidoidea (Hymenoptera: Apocrita) fauna in the Turkish province of Bingöl. Thus, four species within three genera of three families within the Chalcidoidea superfamily — *Eurytoma rosae* Nees, 1834; *Ormyrus discolor* Zerova, 1995; *O. graciosus* (Förster, 1860); and *Perilampus ruficornis* (Fabricius, 1793) — were recognized. Three samples of *Eurytoma rosae* Nees, 1834 were obtained for this study — two female and one male — at various locations within the province of Bingöl. Previous research (Nikol'skaya, 1952; Kılınçer, 1983; Doğanlar, 1984, 1990; Çam, 1994; Bayram *et al.*, 1998; Özbek *et al.*, 1999; Gençer, 2003, 2014; Mitroiu & Koutsoukos, 2023) have detected this species in the Central Anatolia and Eastern Anatolia regions of Türkiye. However, this study was the first to record it in Bingöl province. This study recorded *Ormyrus graciosus* (Förster, 1860) species from Bingöl province, 40 years after it was first discovered in 1984. The species had only previously been identified in the Erzurum region of Türkiye. Once more in 2014, this study recorded *Ormyrus orientalis* Walker, 1871, previously only known from Sivas, Türkiye, as a new record from Bingöl province. Furthermore, in this study, *Perilampus ruficornis* (Fabricius, 1793), first identified in Türkiye's Artvin province in 2023, was documented for the first time in Bingöl province. Even though the species included in this study are found worldwide, it is remarkable that they have only recently been found in Türkiye.

The most recent checklists for the families Eurytomidae, Ormyridae, and Perilampidae in Türkiye are provided. There are six species in one genus from Perilampidae, one genus and 12 species from Ormyridae, and 101 species total across 10 genera in the Eurytomidae family (UCD Community, 2023). In terms of biodiversity, it can be observed that species of the Eurytomidae family are more common in Türkiye than those from the Ormyridae and Perilampidae families. This indicates further research must be done to identify these families.

Author's Contributions

Emin Kaplan: Conceptualization; methodology; formal analysis; investigation; draft preparation; final review and edit; visualization; supervision; project administration and funding acquisition. **Hossein Lotfalizadeh:** Conceptualization; methodology; formal analysis; investigation; draft preparation; final review and edit; visualization; supervision; project administration and funding acquisition.

Funding

Not applicable

Data Availability Statement

All data supporting the findings of this study are available within the paper. The specimens examined in this study are deposited in the first author's collection at the Department of Plant Protection, Faculty of Agriculture, Bingöl University, (Bingöl, Türkiye) and are available by the curator upon request.

Acknowledgments

We express our gratitude to Jean-Yves Rasplus (France) and Prof. Dr. Erol Yıldırım for their advice. I would also like to acknowledge an anonymous referee for their valuable comments on the manuscript.

Ethics Approval

Insects were used in this study. All applicable international, national, and institutional guidelines for the care and use of animals were followed. This article does not contain any studies with human participants performed by the author.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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اطلاعات جدید در مورد زنبورهای Chalcidoidea (Hymenoptera: Chalcidoidea) و لیست به روز شده خانواده های Eurytomidae، Ormyridae و Perilampidae از استان بینگول ترکیه

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تاریخچه مقاله

دریافت: ۱۴۰۲/۰۳/۲۴ | پذیرش: ۱۴۰۳/۰۵/۳۱ | ادبیر تخصصی: مار فرر سوای

پکیده

در این مطالعه زنبورهای بالاخانواده Chalcidoidea از استان بینگول در شرق ترکیه بین سال های ۲۰۱۹ و ۲۰۲۳ جمع آوری شد، که منجر به گزارش جدید چهار گونه از سه خانواده در بالاخانواده Chalcidoidea شد: *Eurytoma rosae* Nees, 1834 (Eurytomidae)، *Ormyrus graciosus* (Förster, 1860)، *O. orientalis* Walker, 1871 (Ormyridae) و *Perilampus ruficornis* (Fabricius, 1793) (Perilampidae). علاوه بر این، نقشه ی پراکنش، مکان های جمع آوری و تصاویر گونه های معرفی شده ارائه شد. در نهایت، یک چک لیست بروز برای زنبورهای سه خانواده Eurytomidae، Ormyridae و Perilampidae ترکیه ارائه شد.

کلمات کلیدی: کلسیدوئیده، رکورد جدید، پراکنش، چک لیست، ترکیه

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Citation: Kaplan, E. & Lotfalizadeh, H. (2024) New knowledges about Chalcidoid wasps (Hymenoptera: Chalcidoidea) from Bingöl province and an updated list of Eurytomidae, Ormyridae and Perilampidae of Türkiye. *J. Entomol. Soc. Iran*, 44 (4). 487-497. <https://doi.org/10.61186/jesi.44.4.11>