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New Faunistic Data for Asilidae (Diptera) Fauna of Türkiye with Specimens Caught by Pitfall Traps

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Pitfall trap.

Abstract: This paper presents three species of robber flies collected by the pitfall trap in 2012 from 5 different habitats in Turkmen mountains, which is not widely used in sampling for these insects but is used as a standard catch method in many different insect families. These species are *Epitriptus micans* (Meigen, 1820), *Dysmachus fuscipennis* (Meigen, 1820) and *Erax hayati* Tomasovic, 2002. *Epitriptus micans* is a new record for the fauna of Türkiye, and all of them were also first recorded in Türkmen Mountains. Additionally, *Erax hayati*, has been reported for the second time since its description from Türkiye, after its type locality, Malatya. The study was compared with other studies in which different capture methods were applied. Brief taxonomic remarks with figures and distributional data are given for each species.

Türkiye Asilidae (Diptera) Faunası İçin Çukur Tuzaklarla Yakalanan Örneklerle Yeni Faunistik Veriler

Anahtar Kelimeler
Epitriptus,
Dysmachus,
Erax,
Haydut sinek,
Çukur tuzak

Öz: Bu makalede, 2012 yılında Türkmen Dağları'nda 5 farklı habitattan, bu grubun örneklenmesinde yaygın olarak kullanılmayan fakat bircok farklı böcek familyasında yaygın yakalama metodu olarak kullanılan çukur tuzak ile yakalanan, 3 haydut sinek türü sunulmaktadır. Bu türler, *Epitriptus micans* (Meigen, 1820), *Dysmachus fuscipennis* (Meigen, 1820) ve *Erax hayati* Tomasovic, 2002 türleridir. *Epitriptus micans*, Türkiye faunası için yeni kayıttır. Ayrıca, türlerin hepsi Türkmen Dağı'nda ilk kez kaydedilmiştir. Ek olarak, tip lokalitesi Malatya'da bulunan *Erax hayati*, tanımlanmasından bu yana Türkiye'den ikinci kez rapor edilmiştir. Çalışmada uygulanan yöntem farklı yakalama yöntemlerinin uygulandığı diğer çalışmalarla karşılaştırılmıştır. Her türün fotoğrafları ve dağılım bilgileriyle birlikte kısa taksonomik açıklamalar verilmiştir.

1. Introduction

Robber flies (Asilidae) are predatory and well-flying dipterans that feed mainly on insects and other arthropods [1]. Approximately 7,500 described and validated species are known worldwide [2]. They are an essential group in ecosystems because of their ecological role as predators and contribute to maintaining balance in insect populations. Therefore, robber flies are generally considered good bioindicators for the conservation of ecosystems [3]. It is known that there are 241 species of these flies belonging to 63 genera in Türkiye [1]. However, considering its zoogeographic position and rich biodiversity potential, Anatolia is likely to host many more species of the family.

Exploring the richness of the world's biodiversity has long been a primary concern of biologists [4]. Insects constitute the most species-rich organism group in nature, especially with their diversity in terrestrial habitats, but anthropogenic habitat destruction and climate change threaten these organisms and other living things [5]. In order to protect biodiversity in the habitat and reduce losses, first of all, the current situation must be analyzed correctly. Sampling methods most suitable for the target organism are a prerequisite for revealing species richness. Entomologists use many sampling methods to study insects' ecology, diversity, and conservation. Commonly used methods for sampling flying insects are light, suction, pan, sticky, baited, interception, and Malaise traps [3].

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The sampling method used for Asilidae in classical faunistic surveys is commonly sweeping vegetation and individual hunting [6]. However, different traps and even combined sampling methods are needed in studies such as species richness, conservation biology, or population dynamics of these insects because family members have many different habitat preferences and behavioral characteristics [3]. In recent years, some researchers have suggested alternative methods such as Malaise, pitfall, and pan traps as sampling methods in studies mainly focus on the bioecology of robber flies [2;7]. This study aims to report the robber fly specimens caught by pitfall traps for the first time from Anatolia. Asilidae specimens were found in pitfall traps for research on ground beetle diversity and seasonal activity (Coleoptera: Carabidae) in the Türkmen Mountains. Three robber fly species belonging to 3 genera were caught in the sampling studies carried out periodically in different habitats at different altitudes for about a year.

2. Materials and Methods

2.1. Study area

This study was carried out between May to November 2012 in the Türkmen Mountains, located within the Aegean and Central Anatolian Regions and the provincial borders of Kütahya and Eskişehir (Figure 1). According to the geographical coordinate system, Türkmen Mountains is located between 39º15'–39º39' northern latitudes and 30º06'–30°35' east longitudes. It is a mountain mass extending in the northwest-southeast direction, and the average altitude is about 700 to 1850 meters. The dominant vegetation elements of the mountains are *Pinus nigra* (black pine), *Pinus sylvestris* (yellow pine), *Quercus robur* (Oak), and *Fagus orientalis* (birch tree) [8;9].

Pitfall traps were set up in 5 different habitats selected at different altitudes on the mountain for sampling (Table 1).

Figure 1. Map of the collecting sites in Türkmen Mountain (Numbers on the map refer to Table 1); The Red mark on the Türkiye map refers to the Türkmen Mountain.

Table 1. Altitudes, coordinates, and habitat features of the study sites.

Study site	Altitudes (m)	Coordinates N	Coordinates E	Habitat type
1	800	39°33'320	30°24'470	Stream bed
2	998	39°32'143	30°24'750	Open pine forest
3	1110	39°31'198	30°23'742	Pine forest with shrubbery
4	1405	39 29 307	30 21 141	Beech forest with shrubbery
5	1577	39°29'278	30°22'272	Shrubbery
6	1700	39°26'210	30°22'360	Close pine forest

2.2. Sampling and İdentification

Five traps were set in each locality, spaced 20 meters apart, and placed in an envelope-like plan. Traps are plastic containers 12 cm in diameter and 11 cm in depth containing a mixture of vine-vinegar and salt as fixative (Figure 2). Traps were checked twice a month, and samples were collected. The collected samples were dried and pinned. All specimens are preserved in the Entomology Collection of Eskişehir Osmangazi University, Science Faculty, Eskişehir, Türkiye.

In the study, 20 (8 males and 12 females) individuals were examined according to the method by [10]. A stereomicroscope (Leica MZ 16) was used for examination, and Leica DFC 490 imaging system was used for imaging. Identification keys and descriptions prepared by [6], [11], [12], [13], [14] were used. The nomenclature follows that of [15].

Figure 2. General view of pitfall traps (photo by ECF).

3. Results

This study reports robber fly specimens caught by pitfall traps for the first time from Anatolia. Asilidae specimens were found in pitfall traps using for research focused on the diversity and seasonal activity of ground beetles (Coleoptera: Carabidae) in the Türkmen Mountains. Three robber fly species belonging to 3 genera were caught in the sampling studies carried out periodically in different habitats at different altitudes for about a year. It was determined that robber fly specimens caught in pitfall traps belonged to 3 different species: *Epitriptus micans* (Meigen, 1820) (8 females and three males), *Dysmachus fuscipennis* (Meigen, 1820) (1 female), and *Erax hayati* Tomasovic, 2002 (3 females and five males) brief taxonomic remarks of the species along with the material and distributional information provided below.

ASILINAE

***Epitriptus* Loew, 1849**

***Epitriptus micans* (Meigen, 1820); <u>New Record</u>** (Appendix A.)

Material examined: Site 1. 1 ♀, 800 m, 07.xi.2012; **Site 2.** 1 ♂, 998 m, 21.x.2012; **Site 3.** 2 ♀♀, 1110 m, 1 ♂, 1110 m, 15.v.2012; **Site 6:** 1 ♀, 1700 m, 01.viii.2012; 2 ♀♀, 1700 m, 30.viii.2012; 1 ♂, 1 ♀, 1700 m, 1 ♀, 1700 m, 17.ix.2012.

Distribution: Belgium, Czechia, Germany [14].

Distribution in Türkiye: New record.

Description

Body: Color is dark grayish brown, 12–18 mm in length.

Head: Facial gibbosity is wide, facial beard primarily black, with white hair on the underside. Postocular setae black, occipital setae white. The second segment on the antenna is half the size of the first segment; the third segment is flat and wide, and the stylus is long and thin.

Thorax: Tomentum grayish brown, all short and long setae are black on the scutum. There are thin and moderately short white and black hairs on the top of the scutellum with 3-4 marginal setae on the scutellum. Wings clear with light brown veins. Anterior side of femora black, with a small red spot before apex, Posterior side of front femur usually brownish red in apical half, middle and hind femora with a narrow posterodorsal brownish red stripe, tibiae brownish red with a black apex and black stripe on the interior side. Tarsomers brownish red and the apex of each tarsomer is black.

Abdomen: Tergits and sternites grayish brown, first tergite with black hairs and bristles along the posterior side, other tergits with weaker white bristles.

***Dysmachus* Loew, 1860**

***Dysmachus fuscipennis* (Meigen, 1820)** (Appendix B)

Material examined: Site 5. 1♀, 1577 m, 19.vi.2012

Distribution: Albania, Azerbaijan, Bulgaria, Czechia, France, Germany, Greece, Italy, Hungary, Moldova, Kazakhstan, Poland, Romania, Russia, Switzerland, Transcaucasia, Türkiye, Ukraine, West Siberia, and former Yugoslavia [14].

Distribution in Türkiye: Bitlis, Bursa, Çanakkale, Diyarbakır, Kütahya, [16], Erzincan [17]; Bingöl, İçel, Kars, Sivas, Van, [18]; Bursa, Çanakkale, Eskişehir, [19; 20].

Description: Since there is no different taxonomic observation for this species, which is one of the most common robber fly species in the Palearctic Region and Anatolia, its known descriptive features are not given.

***Erax* Scopoli, 1763**

***Erax hayati* Tomasovic, 2002** (Appendix C.)

Material examined: Site 3. 1 ♀, 1110 m, 4 ♂♂, 1110 m, 15.v.2012; **Site 6.** 1 ♂, 1700 m, 04.x.2012; **Site 4.** 2 ♀♀, 1405 m, 19.vi.2012.

Distribution: It is endemic to Türkiye [20].

Distribution in Türkiye: Çayköy (Pütürge, Malatya) [12].

Description

Body: Length 15 to 23 mm. Male coloration greyish (Appendix C.).

Head: Face tubercle large, covering most of face, with a distinct dorsal ledge. Beard dense, with very long, thin setae which are mainly white in the middle and black dorsally and laterally. First antennal segment longer than the second, with white and a few black hairs. Segment 3 very slender, longer than segments l+2, tapering. Arista shorter than half of the third segment. Frons with black and a few white hairs. Ocellar tubercle low, with black hairs. Occipital setae long, thin, brownish-yellow. Palps long, slender with yellowish hairs. Setae black.

Thorax: Pronotum with hairs. Mesonotum with greyish tomentum and a narrow dark median stripe which is slightly narrower than the vertex and is divided by a pale narrow stripe. The dark stripe ends in the middle of the postscutum and there is also a wedge-shaped dark stripe before the scutellum. Lateral dark areas indistinct, divided by tomentum at the suture. Hairs long, black in the greater part. White, long hairs between the posterior dorsocentrals. Setae: 2 notopleural, 3-4 supraalar, 3 long and several shorter postalar, 10-12 dorsocentral to middle ofprescutum, 2-5 scutellar. Pleurae with greyish-brown tomentum, with long black hairs dorsally, sparse white hairs ventrally. Scutellum with long white hairs. Wings: With dark spots at cross veins and forks. Microtrichia more or less distinct at the apex. Cell r5, broadly open. Halteres with yellowish stalk and dark head. Legs: Fore and mid-femora black ventrally and anteriorly, reddish-brown dorsally. Hind femora black, with a dorsoposterior

reddish-brown stripe. Fore femora with only long hairs ventrally, mid and hind femora with thin, black or white setae. Fore and mid-tibiae black anteriorly, reddish-brown posteriorly, hind tibiae black, reddish only dorsally at the base. Tarsi reddish-brown.

Abdomen: Greyish to mentum, tergites darker in the middle at certain angles of incidence of light, except at the posterior margin. Discal setae on tergites 1-7 yellowish or a few setae in the middle black. Some setae seen in lateral part of tergites. Hairs on tergites short, black in the middle, whitish laterally. Sternites with some yellowish setae near the posterior margin and with long, black and white hairs.

Male genitalia: Hypopygium black. Parts of the epandrium thin, with a narrower quarter, with a rounded tip and a dense group of short black spines within. Aedeagus with wide sheath. Dististylus slender, flat and curled, hypandrium deeply concave posteriorly.

4. Discussion and Conclusion

The results of the study provided new contributions to the information about the Turkish Asilidae Fauna. The presence of *Dysmachus fuscipennis*, which has a wide distribution both in the Palearctic region and in Türkiye, is not surprising in the Türkmen Mountains. *Epitriptus micans*, known in Central Europe, was recorded for the first time in Anatolia. The taxonomical features observed in both male and female material of it confirm with the description in Geller- Grimm, 2003 [14]. This record formed the west boundary of the distribution of the species in the Palearctic region and the number of Turkish robber fly species reached 242. *Erax hayati* was firstly described by Tomasovic, 2002 [12], from a single locality in Çayköy (Pütürge, Malatya) and is endemic to Anatolia [21]. So far it has not been reported from any other part of the country and is recorded from Anatolia for the second time in this study after 20 years. The identification of the species was confirmed by the author, Tomasovic, who described it.

There are many species in Asilidae that differ from each other in terms of their bioecological characteristics such as habitat preference, hunting behavior and flight activity [22]. Therefore, different researchers report that the performance of the sampling method to be preferred for these insects depends on the different characteristics and habitat preferences of the species [3;7;2].

McCravy, 2017 [3] states that as a result of long-term sampling in different habitats using the Malaise trap, it can be preferred as an effective sampling method for robber flies, but the trap performance may vary depending on the species and habitat type. Similarly, Dekonick et al. 2018, [7] emphasized that the number and species of robber flies caught in the traps vary greatly in their periodic sampling using three different trap techniques (yellow pan trap, white pan trap and pitfall trap).

In this study, Asilidae specimens that fell into the pitfall traps set for the ground beetles were evaluated. The most common species in the traps was *Epitriptus micans* and totally 11 individuals were caught in four different sites in May, August, September, October and November. Dekoninck et al. 2018, [7] stated that *Tolmerus atricapillus* was caught in pitfall traps, but more specimens were collected with yellow pan trap and white pan trap. Considering both our results and that of Dekoninck et al. 2018 [7], it may be thought that pitfall trap can be used in sampling for *Epitriptus* spp.

During the one-year sampling period in the study area, only one *Dysmachus fuscipennis* individual was caught in the pitfall traps. According to this result, we think that this individual may have been caught by chance or that the species may be not common in the region. So, whether the pitfall trap is an effective capture method for *D. fuscipennis* can only be revealed with further research. On the other hand, Dekoninck et al. 2018 [7], reported that *Dysmachus trigonus* was the most abundant species caught by pitfall trap. These two different results from two different species of the same genus suggest that species-specific behavioral differences may affect pitfall trap performance for Asilidae specimens.

The last species found in the traps was *Erax hayati*. There is no information in the literature regarding individuals of this genus were caught by pitfall traps. Therefore, the result is the first data that pitfall traps can be an alternative collecting method for *Erax* spp.

We know that with the limited data gathered from a study essentially focusing on another insect group, it would not be sufficient to propose a suitable capture method for a large taxon such as Asilidae. However, since a significant number of individuals were caught in traps, as seen in *Epitriptus micans*, we think that the pitfall trap may be an alternative sampling method for robber flies together with the other methods. As highlighted by McCravy, 2017 [3] and Dekoninck et al. 2018 [7], more research is needed on the effectiveness of this economical and easy method for all family members.

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Declaration of Ethical Code

In this study, we undertake that all the rules required to be followed within the scope of the "Higher

Education Institutions Scientific Research and Publication Ethics Directive" are complied with, and that none of the actions stated under the heading "Actions Against Scientific Research and Publication Ethics" are not carried out.

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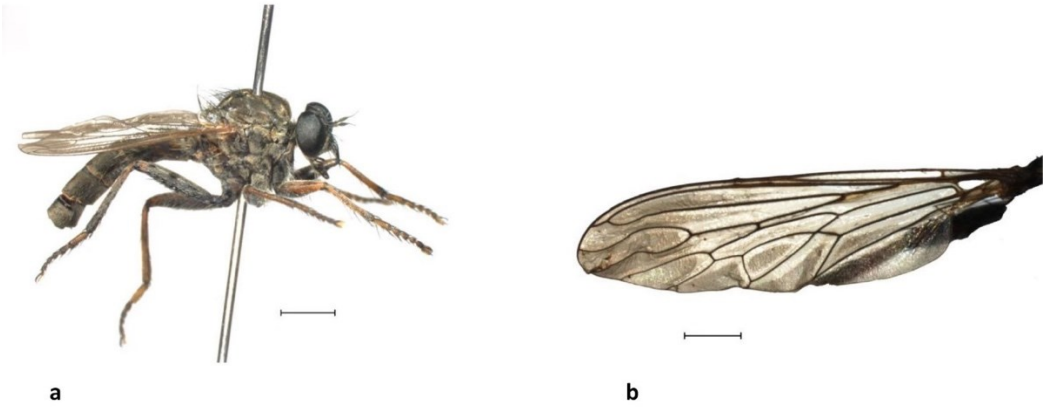
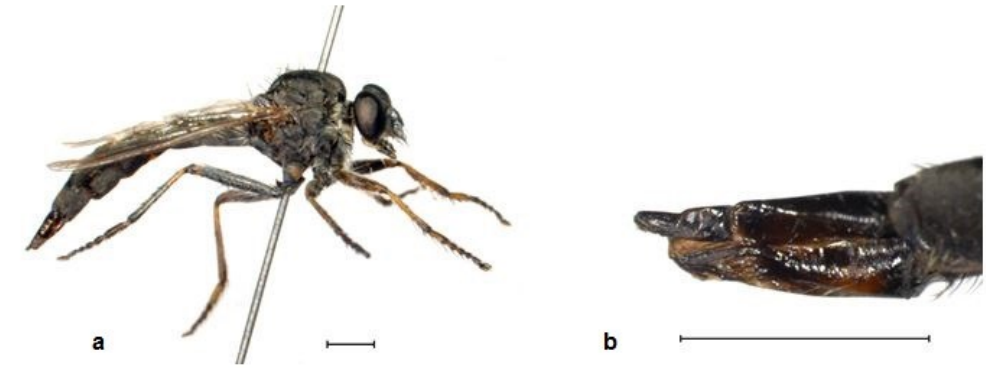
Appendices

Appendix A. Figures of *Epitriptus micans* (Meigen, 1820).



A.1. a) Male *Epitriptus micans* (Meigen, 1820) (Scale 2 mm), b) wing (Scale 1 mm).



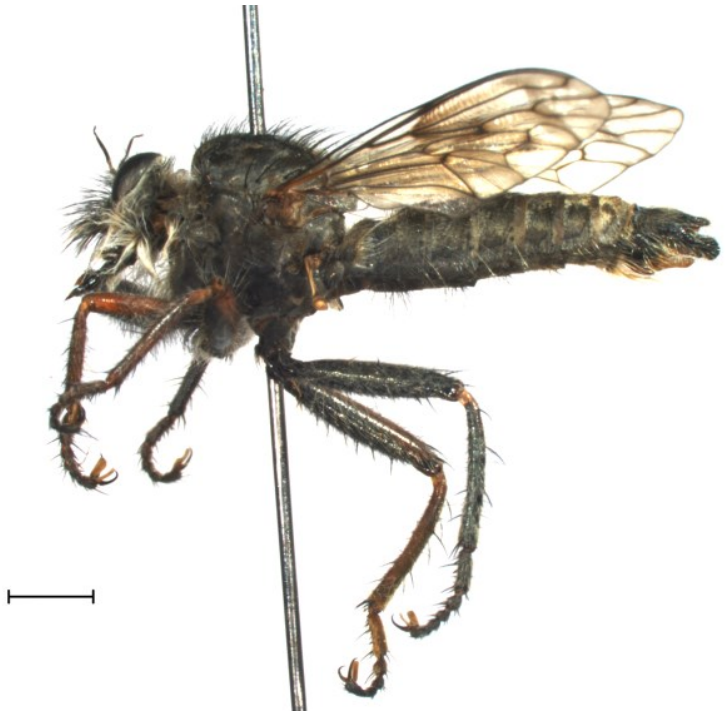
A.2. a) Female *Epitriptus micans* (Meigen, 1820), b) genitalia, general view. (Scale 2 mm).

A.3. Male genitalia of *Epitriptus micans* (Meigen, 1820). a) gonocoxite and dististylus, b) dististylus, c) hypandrium, d) epandrium (lateral), e) epandrium (dorsal) (Scale 0,2 mm).

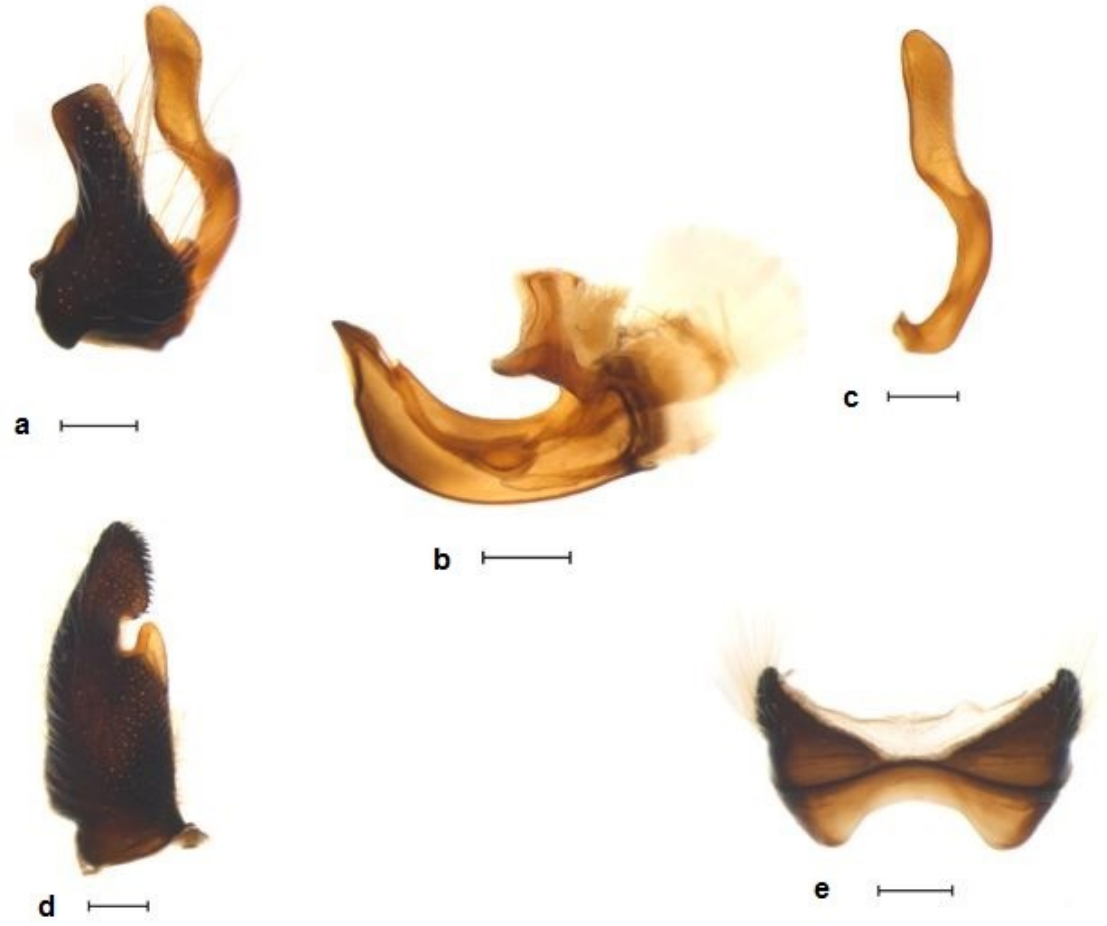
Appendix B. Figure of Female *Dysmachus fuscipennis* (Meigen, 1820).

B.1. a) Female *Dysmachus fuscipennis* (Meigen, 1820), b) Female genitalia lateral (Scale 2 mm).

Appendix C. Figures of male *Erax hayati* Tomasovic, 2002.



C.1. Male *Erax hayati* Tomasovic, 2002 (Scale 2 mm).



C.2. Male genitalia of *Erax hayati* Tomasovic, 2002, a) gonocoxite and dististylus, b) aedegus, c) dististylus, d) epandrium, e) hypandrium (Scale 0,4 mm).