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Faunistic studies on Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae (Coleoptera) families detected by pitfall and bait trapping methods in Balya region (Balıkesir Province) in Türkiye

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Abstract

This study was carried out in oak fields located in the Balya region of Balıkesir province of Turkey. Our study aimed to identify species belonging to the Coleoptera order using bait and pitfall traps. Our research was conducted between 28 May-19 October(2019) and 10 May-21 October(2020). As a result of the study, 37 species belonging to 26 genera from the families Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae, included in the Coleoptera order, were recorded. Among the identified species, 31 species were recorded in Çamavşar and 29 species in Kocaçay. The pitfall trap was more effective than the bait trap in capturing the species. While Polydrusus gracilicornis Kiesenwetter, 1864 *was detected only in the bait trap, 9 different species were recorded in both trap methods. 17 of the 37 species identified are saproxylic insects. 6 of these species are on the red list of the International Union for Conservation of Nature (IUCN). These species include Cerambyx cerdo* Linnaeus, 1758 *NT (near threatened), Hesperophanes sericeus* Fabricius, 1787*, Hylotrupes bajulus* Linnaeus, 1758 *and Icosium tomentosum* Lucas, 1854 *species LC(common) from the Cerambycidae family; Ampedus praeustus* (Fabricius, 1792) *and Lacon punctatus* (Herbst, 1779*) species from the Elateridae family are in the LC category.*

Keywords: *Balya, bait trap, coleoptera, pitfall trap, red list, saproxylic*

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Türkiye'de Balya bölgesinde (Balıkesir ili) tuzak ve yem yakalama yöntemleriyle tespit edilen Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae (Coleoptera) familyaları üzerinde faunistik araştırmalar

Öz

Bu çalışma, Türkiye'nin Balıkesir ilinin Balya bölgesinde bulunan meşe tarlalarında yürütülmüştür. Çalışmamız ile besin ve çukur tuzakları kullanılarak Coleoptera takımına ait türlerin belirlenmesi amaçlanmıştır. Araştırmamız 28 mayıs-19 ekim (2019) ve 10 mayıs-21 ekim (2020) arasında yapılmıştır. Çalışma sonucunda Coleoptera ordosuna dahil Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae familyalarından 26 cinse ait 37 tür kaydedilmiştir. Tespit edilen türlerden Çamavşar'da 31, Kocaçay'da ise 29 tür kaydedildi. Türlerin yakalanmasında çukur tuzak besin tuzağına göre daha etkili olmuştur. Polydrusus gracilicornis Kiesenwetter, 1864*, sadece besin tuzağında tespit edilirken, her iki tuzak yönteminde ise 9 farklı tür kaydedilmiştir. Tespit edilen 37 türün 17'si saproksilik böceklerdir. Bu türlerden 6'sı Uluslararası Doğa Koruma Birliği (IUCN)'nin kırmızı listesinde bulunmaktadır. Bu türler arasında Cerambycidae familyasından Cerambyx cerdo* Linnaeus, 1758 *NT (yakın tehdit), Hesperophanes sericeus* Fabricius, 1787*, Hylotrupes bajulus* Linnaeus, 1758 *ve Icosium tomentosum* Lucas, 1854 *türleri LC (yaygın); Elateridae familyasından Ampedus praeustus* (Fabricius, 1792) *ve Lacon punctatus* (Herbst, 1779*) türleri ise LC kategorisinde bulunmaktadır.*

Anahtar kelimeler: *Balya, besin tuzak, coleoptera, çukur tuzak, kırmızı liste, saproksilik*

1. Introduction

In recent years, most of the studies carried out in Türkiye and abroad are aimed at preserving ecological balance and biological diversity for a sustainable world. In particular, research has focused on saproxylic insects due to the use of insects as biological indicators and their important roles in nutrient cycling, decay and pollination in the natural ecosystem and their reflection of the quality of forests. Saproxylic insects are insects that depend on wood at some stage of their own development or the decomposition of rotting wood [1-5].

In studies on ecologically important saproxylic beetles, the hole trapping method is mostly used to determine the soil fauna and species at the tree böse, and the window trapping method is used to identify wood-dependent species plase on the tree trunk. However, unlike these collection methods, bait traps using fermented nutrients have an important place in studies aimed at revealing beetle biodiversity [6-8]. There are also studies showing that some methods used in collecting species of the Coleoptera order from nature have differences in terms of efficiency. Hyvärinen et al. (2006), the window trap method was more effective than the pitfall trap [9]. According to Økland (1996), more efficiency was determined in the window trap than in the extraction cylinder mounted on a dead tree trunk.

Extensive studies have been carried out on ecologically important saproxylic beetles using different trapping methods. In these studies, along with the pitfall trapping method, was used to determine the soil fauna and species at the tree base, and the window trapping method was used to determine the species placed on the tree trunk and dependent on wood. In addition to different trapping methods, the bait trap method is also used to detect beetle fauna in different study areas.

Europe is one of the regions where saproxylic beetle fauna is most researched. It provides important data for researchers about insect fauna and endemism rates. In Europe, Anobiidae (1/1), Boridae (1/0), Bostrichidae (22/3), Buprestidae (1/1), Cerambycidae (153/32), Cerophytidae (1/0), Cetoniidae (24/8), Cucujidae (6/2), Elateridae (115/56), Erotylidae (23/ 9), Euchiridae (2/1), Eucnemidae (31/15), Latridiidae (1/0), Leiodidae (1/1) , Lucanidae (14/6), Melandryidae (1/0), Mycetophagidae (15/2), Prostomidae (1/0), Pythidae (3/0), Rhysodidae (3/0) and Trogositidae (16/6) saproxylic 435 species belonging to insect families have been identified and 143 of them have been reported to be endemic to Europe [10].

In the study conducted by Avgın et al. (2014), the saproxylic beetle species in Türkiye, which are on the European red list, were reviewed. In the study, 151 saproxylic beetle species belonging to the Bostrichidae, Cerambycidae, Elateridae, Euchiridae Eucnemidae, Lucanidae, Mycetophagidae and Scarabaeidae families were identified [11].

The order Coleoptera is the group with the most species in the insect kingdom. Although the number of species of the Coleoptera order is so high, the number of species identified in Türkiye is very low. This number is 11910 for Türkiye. Families of this order, such as Anobiidae, Boridae, Bostrichidae, Buprestidae, Cerambycidae, Cetoniidae, Chrysomelidae, Cryptophagidae, Cucujidae, Curculionidae, Elateridae, Erotylidae, Euchiridae, Eucnemidae, Latridiidae, Leiodidae, Lucanidae, Melandryidae, Prostomidae, Rhysodidae, Scarabaeidae and Tenebrionidae are found in forest areas. Many of these families are family groups that include saproxylic beetle species [12-14].

Quercus areas, which are very important for saproxylic insects, have decreased considerably nowadays. Balya, which was chosen as the study area because it is an important place for *Quercus* spp. is located in the northwest of Balıkesir province. The district's altitude above sea level is 230 meters. With this study, species belonging to the Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae families will be determined for the first time by using bait and pitfall trapping methods in the old oak areas of the Balya district within the borders of Balıkesir province. Thanks to the saproxylic species belonging to the beetle families to be identified, it is aimed to determine the saproxylic beetle species that are on the European Union red list and considered to be important for Türkiye and the Palaearctic region, which are under threat.

2. Material and method

This study was conducted in monthly periods between 28 May-19 October 2019 and 10 May-21 October 2020. In order to determine the species of Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae families, Çamavşar and Kocaçay locations of Balya district of Balıkesir province (Table 1). A total of 10 different

aged oak trees were identified in these 2 different regions and bait and pitfall trapping methods were used (Figure 1).

Sampling was done using bait (B) and pitfall (P) trap methods. For the food trap, the trap liquid consisting of a mixture of 100 ml wine, 900 ml water, 25 g sugar and 25 ml vinegar was preferred, as previously used by Tezcan and Okyar (2004) in their studies in Izmir and Manisa provinces [15]. To create a bait trap, one liter of the prepared trap liquid was placed in 2.5-liter plastic jars. This trap was hung on the trunks or main branches of oak trees with a rope at a height of 1-1.5 m from the ground (Figure 2A). For pitfall traps, plastic containers with a top diameter of 6.5 cm were placed in the tree soil according to the hollow conditions of the oak trees, with their mouths at the same level as the top of the soil. It was camouflaged with stones and plant parts by filling it halfway with a mixture of ethylene glycol and water in a 1:1 ratio (Figure 2B).

The samples obtained were labeled and brought to the laboratory for further processing. The samples caught with bait and pitfall traps were removed from the traps and lanet, then placed in 70% alcohol. Then, it was prepared in accordance with entomological preparation techniques in accordance with the sample sizes for diagnosis. The insects collected by Aylin Tüven and Zübeyde Nur Yalçın were examined under a stereo microscope model Nicon SMZ1500 and divided into higher taxa. Definitive identification of the insects was made by field experts Nicklas JANSSON and Stanislav SNÄLL. Sample materials were collected in Balıkesir University, Faculty of Arts and Sciences, Department of Biology, Zoology Museum (BUZM).

Table 1. The information belonging to study fields

Trap No.	**Study Area Location**	**Altitude**	**Coordinates**	**Studied Tree**
1 B-P	Balya-Kocaçay	449 m	39˚41’40’’N 27˚24’35’’ E	*Quercus* spp.
2 B-P		459 m	39˚41’39’’N 27˚24’37’’ E	
3 B-P		457 m	39˚41’43’’N 27˚24’39’’ E	
4 B-P		446 m	39˚41’50’’N 27˚24’45’’ E	
5 B-P		446 m	39˚41’47’’N 27˚24’51’’ E	
6 B-P	Balya-Çamavşar	421 m	39˚41’58’’N 27˚24’58’’ E	
7 B-P		446 m	39˚42’00’’N 27˚25’02’’ E	
8 B-P		414 m	39˚42’05’’N 27˚25’00’’ E	
9 B-P		448 m	39˚42’03’’N 27˚25’06’’ E	
10 B-P		415 m	39˚42’08’’N 27˚25’05’’ E	

Figure 1. The map of the study fields (google earth)

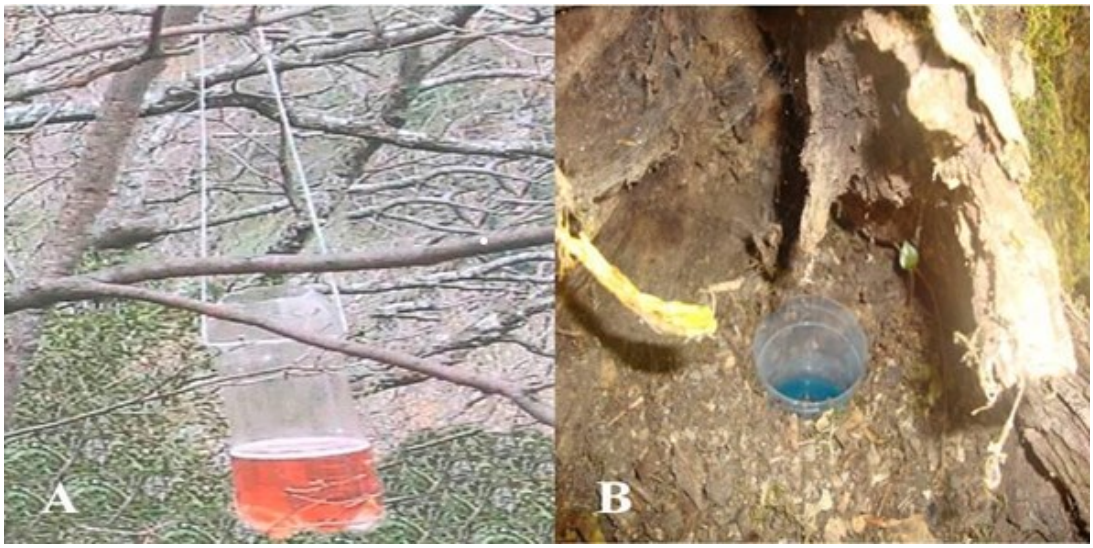

Figure 2. The trapping methods. A. bait trap; B. pitfall trap (photos by Sürgüt H.)

3. Results

Family: Carabidae
Acupalpus meridianus (Linnaeus, 1761)
Material studied: Balya; Çamavşar Location, 446 m., 28.05.2019, P7, Tüven A., 6 exs; 415 m., 11.07.2019, P10, Tüven A., 12 exs; 448 m., 13.08.2020, P9, Tüven A., 9 exs. Totally 27 exs.

Brachinus crepitans (Linnaeus, 1758)
Material studied: Balya; Çamavşar Location, 425 m., 13.09.2019, P6, Tüven A., 13 exs; 459 m., 19.7.2020, P2, Tüven A., 9 exs; **Balya; Kocaçay Location**, 459 m., 16.6.2019, P2, Tüven A., 5 exs; 446 m.,07.6.2020, P4, Tüven A., 7 exs. Totally 34 exs.

Brachinus explodens Duftschmid, 1812
Material studied: Balya; Çamavşar Location,., 448 m., 28.05.2019, P9, Tüven A., 10 exs; 446 m., 13.9.2019, P7, Tüven A., 16 exs.; **Balya; Kocaçay Location**, 449 m., 10.5.2020, P1, Tüven A., 9 exs. Totally 35 exs.

Calathus fuscipes (Goeze, 1777)
Material studied: Balya; Kocaçay Location, 446 m., 13.8.2020, P4, Tüven A., 5 exs.; 457 m., 19.7.2020, P3, Tüven A., 5 exs. Totally 10 exs.

Carabus convexus Fabricius, 1775
Material studied: Balya; Çamavşar Location, 421 m., 09.10.2019, P6, Tüven A., 21 exs.; 446 m., 19.7.2020, P7, Tüven A., 9 exs. Totally 30 exs.

Carabus coriaceus Linnaeus, 1758
Material studied: Balya; Çamavşar Location, 414 m., 16.06.2019, P8, Tüven A., 10 exs.; 414 m., 10.5.2020, P8, Tüven A., 1 exs.; **Balya; Kocaçay Location**, 459 m., 27.9.2020, P2, Tüven A., 2 exs.; 446 m.,21.10.2020, P5, Tüven A., 3 exs. Totally 16 exs.

Family: Cerambycidae

Acanthocinus griseus Fabricius,1792
Material studied: Balya; Çamavşar Location, 421 m., 19.10.2019, P6, Tüven A., 2 exs; 414 m., 13.9.2019, P8, Tüven A., 1 exs; **Balya; Kocaçay Location**, 457 m., 27.9.2020, P3, Tüven A., 5 exs. Totally 8 exs.

Cephalocrius syriacus Sharp, 1905
Material studied: Balya; Çamavşar Location, 421 m., 07.6.2020, P6, Tüven A., 1 exs; 448 m., 27.9.2020, P9, Tüven A., 1 exs. Totally 2 exs.

Cerambyx cerdo Linnaeus, 1758
Material studied: Balya; Çamavşar Location, 446 m., 28.5.2019, P7, Tüven A., 4 exs; 415 m., 21.8.2019, P10, Tüven A., 1 exs; **Balya; Kocaçay Location**, 449 m., 10.5.2020, P1, Tüven A., 1 exs. Toplam 6 exs.

Hesperophanes sericeus Fabricius, 1787
Material studied: Balya; Çamavşar Location, 415 m., 7.6.2020, P10, Tüven A., 2 exs; **Balya; Kocaçay Location**, 449 m., 11.7.2019, B4, Yalçın Z.N., 1 exs. Totally 3 exs.

Hylotrupes bajulus Linnaeus, 1758
Material studied: Balya; Çamavşar Location, 414 m., 21.8.2019, P8, Tüven A., 2 exs; 448 m., 21.8.2019, P9, Tüven A., 1 exs; **Balya; Kocaçay Location**, 446 m., 10.5.2020, P5, Tüven A., 3 exs. Totally 6 exs.

Icosium tomentosum atticum Ganglbauer, 1881
Material studied: Balya; Çamavşar Location, 414 m., 16.6.2019, P8, Tüven A., 1 exs; **Balya; Kocaçay Location**, 459 m., 11.7.2020, B2, Yalçın Z.N., 1 exs. Totally 2 exs.
Family: Curculionidae

Oedecnemidius varius Brullé, 1832

Material studied: Balya; Kocaçay Location, 449 m., 09.10.2019, P1, Tüven A., 2 exs; 446 m., 10.5.2020, B5, Yalçın Z.N., 2 exs. Totally 4 exs.

Phyllobius achardi Desbrochers, 1873
Material studied: Balya; Çamavşar Location, 448 m., 16.6.2019, P9, Tüven A., 6 exs; **Balya; Kocaçay Location**, 449 m., 7.6.2020, B1, Yalçın Z.N., 2 exs. Totally 8 exs.

Phyllobius canus Gyllenhal, 1834
Material studied: Balya; Çamavşar Location, 421 m., 7.6.2020, P6, Tüven A., 10 exs; **Balya; Kocaçay Location**, 459 m., 13.8.2020, P2, Tüven A., 2 exs. Totally 12 exs.

Phyllobius parviceps Desbrochers, 1873
Material studied: Balya; Çamavşar Location, 446 m., 28.5.2019, P7, Tüven A., 1 exs. Totally 1 exs.

Polydrusus elegans Reitter, 1887
Material studied: Balya; Çamavşar Location, 421 m., 13.8.2020, P6, Tüven A., 7 exs. 448 m., 27.9.2020, B9, Yalçın Z.N., 3 exs. Totally 10 exs.

Polydrusus gracilicornis Kiesenwetter, 1864
Material studied: Balya; Çamavşar Location, 415 m., 21.8.2019, B10, Yalçın Z.N., 1 exs. Totally 1 exs.

Sitona lepidus Gyllenhal, 1834
Material studied: Balya; Çamavşar Location, 415 m., 13.9.2019, P10, Tüven A., 3 exs; **Balya; Kocaçay Location**, 457 m., 11.7.2020, P3, Tüven A., 2 exs. Totally 5 exs.

Sitona lividipes Fåhraeus, 1840
Material studied: Balya; Çamavşar Location, 415 m., 27.9.2020, P10, Tüven A., 1 exs; **Balya; Kocaçay Location**, 449 m., 21.10.2020, P1, Tüven A., 2 exs. Totally 3 exs.

Family: Elateridae

Ampedus praeustus (Fabricius, 1792)
Material studied: Balya; Çamavşar Location, 415 m., 28.05.2019, P10, Tüven A., 7 exs; 415 m., 27.09.2020, P10, Tüven A., 5 exs. Totally 12 exs.

Calais parreyssi (Steven, 1830)
Material studied: Balya; Çamavşar Location, 421 m., 11.7.2019, B6, Yalçın Z.N., 2 exs; 448 m., 13.8.2020, P9, Tüven A., 1 exs; **Balya; Kocaçay Location**, 446 m., 19.7.2020, B5, Yalçın Z.N., 2 exs. Totally 5 exs.

Drasterius bimaculatus (Rossi, 1790)
Material studied: Balya; Çamavşar Location, 446 m., 13.9.2019, P7, Tüven A., 4 exs; **Balya; Kocaçay Location**, 446 m., 10.5.2020, P5, Tüven A., 1 exs; 446 m., 13.8.2020, P5, Tüven A., 13 exs. Totally 18 exs.

Lacon punctatus (Herbst, 1779)
Material studied: Balya; Kocaçay Location, 449 m., 13.8.2020, P1, Tüven A., 3 exs; 457 m., 16.6.2019, P3, Tüven A., 1 exs. Totally 4 exs.

Melanotus fusciceps (Gyllenhal, 1817)
Material studied: Balya; Çamavşar Location, 414 m., 13.9.2019, P8, Tüven A., 2 exs; **Balya; Kocaçay Location**, 457 m., 16.6.2019, B3, Yalçın Z.N., 1 exs. Totally 3 exs.

Familya: Scarabaeidae

Copris lunaris (Linnaeus, 1758)
Material studied: Balya; Çamavşar Location, 414 m., 28.5.2019, P8, Tüven A., 3 exs; 415 m., 7.6.2020, P10, Tüven A., 6 exs; **Balya; Kocaçay Location**, 459 m., 11.7.2020, P1, Tüven A., 1 exs. Totally 10 exs.

Oxythyrea cinctella (Schaum, 1841)
Material studied: Balya; Çamavşar Location, 414 m., 13.8.2020, P8, Tüven A., 11 exs; **Balya; Kocaçay Location**, 449 m., 27.9.2020, P1, Tüven A., 8 exs. Totally 19 exs.

Protaetia afflicta (Gorry ve Percheron, 1833)
Material studied: Balya; Çamavşar Location, 415 m., 13.8.2020, P10, Tüven A., 2 exs. Totally 2 exs.

Protaetia subpilosa (D. des Loges, 1869)
Material studied: Balya; Çamavşar Location, 4446 m., 9.10.2019, P7, Tüven A., 1 exs; 448 m., 27.9.2020, P9, Tüven A., 4 exs; **Balya; Kocaçay Location**, 449 m., 11.7.2020, P1, Tüven A., 2 exs. Totally 7 exs.

Protaetia vidua (Gorry ve Percheron, 1833)
Material studied: Balya; Çamavşar Location, 421 m., 16.6.2019, P6, Tüven A., 3 exs; **Balya; Kocaçay Location**, 446 m., 11.7.2019, P4, Tüven A., 2 exs. Totally 5 exs.

Scarabaeus pius (İlliger, 1803)
Material studied: Balya; Çamavşar Location, 446 m., 21.8.2019, P7, Tüven A., 1 exs; 448 m., 13.9.2019, P9, Tüven A., 2 exs; **Balya; Kocaçay Location**, 449 m., 13.8.2020, P1, Tüven A., 2 exs. Totally 5 exs.

Scarabaeus typhon (Fischer, 1824)
Material studied: Balya; Kocaçay Location, 446 m., 10.5.2020, P4, Tüven A., 2 exs. Totally 2 exs.

Tropinota hirta (Poda, 1761)
Material studied: Balya; Kocaçay Location, 446 m., 28.5.2019, P4, Tüven A., 1 exs; 446 m., 27.9.2020, P5, Tüven A., 3 exs. Totally 4 exs.

Family: Staphylinidae

Ocypus curtipennis Motschulsky, 1849
Material studied: Balya; Çamavşar Location, 446 m., 21.8.2019, P7, Tüven A., 4 exs; **Balya; Kocaçay Location**, 459 m., 7.6.2020, P2, Tüven A., 6 exs. Totally 10 exs.
Ocypus mus (Brullé, 1832)
Material studied: Balya; Çamavşar Location, 414 m., 16.06.2019, P8, Tüven A., 8 exs.;, 448 m., 21.8.2019, P9, Tüven A., 1 exs.; **Balya; Kocaçay Location**, 449 m., 19.7.2020, P1, Tüven A., 4 exs.; 446 m., 13.8.2020, P5, Tüven A., 3 exs. Totally 16 exs.

Ocypus sericeicollis (Ménétriés, 1832)
Material studied: Balya; Kocaçay Location, 446 m., 11.7.2019, B4, Yalçın Z.N., 6 exs.; 459 m., 13.8.2020, B2, Yalçın Z.N., 2 exs.; 457 m., 7.6.2020, P3, Tüven A., 6 exs. Totally 14 exs.

Quedius cruentus (A.G Olivier, 1795)
Material studied: Balya; Çamavşar Location, 448 m., 13.9.2019, B9, Yalçın Z.N., 3 exs; **Balya; Kocaçay Location**, 459 m., 10.5.2020, P2, Tüven A., 6 exs. Totally 9 exs.

4. Discussion and conclusions

As a result of this study, 10 different old oak trees determined in Çamavşar and Kocaçay locations between April and October 2019-2020 in the Balya region (Balıkesir) were used in bait and pitfall trap methods, belonging to the families Carabidae, Cerambycidae, Curculionidae, Elateridae, Scarabaeidae and Staphylinidae. A total of 37 species were identified among 368 individuals from 26 genera.

Six species of these insects have been identified in the Carabidae family. These species; *Acupalpus meridianus* (Linnaeus, 1761), *Brachinus crepitans* (Linnaeus, 1758), *Brachinus explodens* Duftschmid, 1812, *Calathus fuscipes* (Goeze, 1777), *Carabus convexus* Fabricius, 1775, *Carabus coriaceus* Linnaeus, 1758;

Six species belonging to the Cerambycidae family; *Acanthocinus griseus* Fabricius, 1792, *Cephalocrius syriacus* Sharp, 1905, *Cerambyx cerdo* Linnaeus, 1758, *Hesperophanes sericeus* Fabricius, 1787, *Hylotrupes bajulus* Linnaeus, 1758, *Icosium tomentosum* Lucas, 1854;

Eight species belonging to Curculionidae familyasına; *Oedecnemidius varius* Brullé, 1832, *Phyllobius achardi* Desbrochers, 1873, *Phyllobius canus* Gyllenhal, 1834, *Phyllobius parviceps* Desbrochers, 1873, *Polydrusus elegans* Reitter, 1887, *Polydrusus gracilicornis* Kiesenwetter, 1864, *Sitona lepidus* Gyllenhal, 1834, *Sitona lividipes* Fåhraeus, 1840;

Five species belonging to the Elateridae family; *Ampedus praeustus* (Fabricius, 1792); *Calais parreyssi* (Steven, 1830); *Drasterius bimaculatus* (Rossi, 1790); *Lacon punctatus* (Herbst, 1779); *Melanotus fusciceps* (Gyllenhal, 1817);

Eight species belonging to the Scarabaeidae family; *Copris lunaris* (Linnaeus, 1758), *Oxythyrea cinctella* (Schaum, 1841), *Protaetia afflicta* (Gorry ve Percheron, 1833), *Protaetia subpilosa* (D. des Loges, 1869), *Protaetia widow* (Gorry ve Percheron, 1833), *Scarabaeus pius* (Illiger, 1803), *Scarabaeus typhon* (Fischer, 1824), *Tropinota hirta* (Poda, 1761);

Four species belonging to the Staphylinidae family; *Ocypus curtipennis* Motschulsky, 1849, *Ocypus mus* (Brullé, 1832), *Ocypus sericeicollis* (Ménétriés, 1832), *Quedius cruentus* (AG Olivier, 1795).

The number of species determined in two areas in the Balya region varies according to families; 31 species were detected in Çamavşar locality and a total of 29 species were detected in Kocaçay locality (Figure 3).

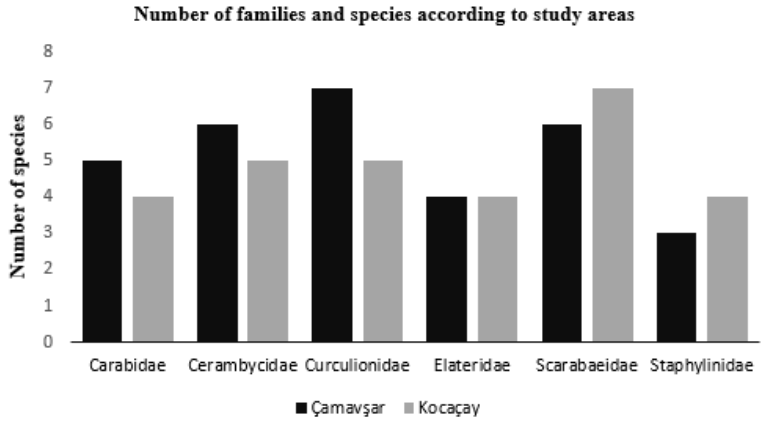

Figure 3. Number of families and species by study areas

The number of insects species caught according to trap types varies according to families. All insects belonging to the Carabidae and Scarabaeidae families were caught with pitfall traps. Although insects belonging to other families were caught by both methods, it was noted that the number was higher in pitfall traps. According to our study results, it has been determined that pitfall traps are more efficient in catching insects than bait traps (Figure 4).

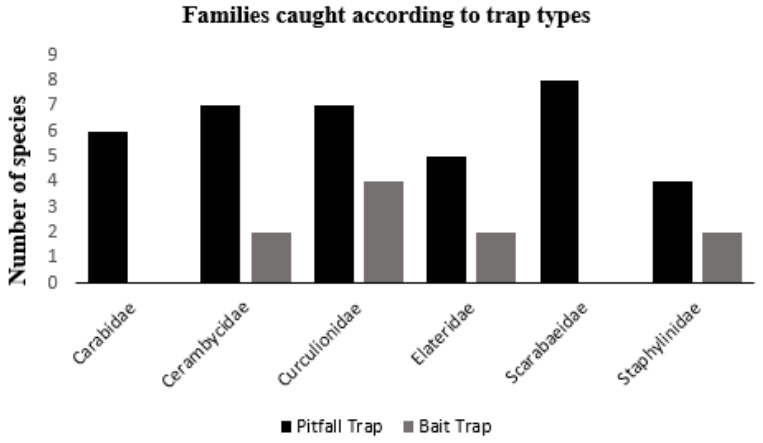

Figure 4. Number of families and species caught by trap types

Of the species identified as a result of the study, only *P. gracilicornis* Kiesenwetter, 1864 was caught with the bait trap set on oak trees. *O. sericeicollis* (Ménétriés, 1832), *Q. cruentus* (A. G. Olivier, 1795), *C. parreyssi* (Steven, 1830), *M. fusciceps* (Gyllenhal, 1817), *H. sericeus* Fabricius, 1787, *I. tomentosum atticum* Ganglbauer, 1881, *O. varius* Brullé, 1832, *P. achardi* Desbrochers, 1873, *P. elegans* Reitter, 1887 species were found in the study areas by both bait trap and pitfall trap methods.

Also, 1 species belonging to the Staphylinidae family identified as a result of the study; *Q. cruentus* (AG Olivier, 1795), 4 species belonging to the Elateridae family; *A. praeustus* (Fabricius, 1792), *C. parreyssi* (Steven, 1830), *L. punctatus* (Herbst, 1779), *M. fusciceps* (Gyllenhal, 1817), 6 species belonging to the Cerambycidae family; *A. griseus* Fabricius, 1792, *C. syriacus* Sharp, 1905, *C. cerdo* Linnaeus, 1758, *H. sericeus* Fabricius, 1787, *H.*

bajulus Linnaeus, 1758, *I. tomentosum Lucas, 1854*, and 6 species belonging to the Curculionidae family; *O. varius* Brullé, 1832, *P. achardi* Desbrochers, 1873, *P. canus* Gyllenhal, 1834, *P. parviceps* Desbrochers, 1873, *P. elegans* Reitter, 1887, *P. gracilicornis* Kiesenwetter, 1864 were found as saproxylic complex species. 6 of these species are on the International Union for Conservation of Nature (IUCN) red list of threatened species (Table 2) [16].

Table 2 European red list distribution of the identified saproxylic beetles.

Families	**Saproxylic beetles**	**European red list category**
Cerambycidae	*Cerambyx cerdo* Linnaeus, 1758	NT
Cerambycidae	*Hesperophanes sericeus* Fabricius, 1787	LC
Cerambycidae	*Hylotrupes bajulus* Linnaeus, 1758	LC
Cerambycidae	*Icosium tomentosum* Lucas, 1854	LC
Elateridae	*Lacon punctatus* (Herbst, 1779)	LC
Staphylinidae	*Ampedus praeustus* (Fabricius, 1792)	LC

Considering Turkey's location and ecological richness, it is expected that the diversity of species identified, especially in forested areas, would be higher than recorded, but when IUCN 2023-1 data are evaluated and the findings of the survey on Mediterranean basin and European saproxylic insect species and threat categories published by IUCN in 2018 are considered, it is clearly seen that Turkey does not reflect the possible species richness and there is not enough data on many species [17].

In this study on terrestrial insect species in Balya Region, a total of 37 species were identified. Considering the ecosystem and habitat diversity of the region, it is thought that insect biodiversity will increase even more with long-term studies on different species.

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