Türk. entomol. derg., 2023, 47 (2): 149-166
DOI: http://dx.doi.org/10.16970/entoted.1232172

ISSN 1010-6960
E-ISSN 2536-491X

Original article (Orijinal araştırma)

Saproxylic beetles on oaks in a wooded pasture in the Eastern Mediterranean Region and contributions to Turkish entomofauna[1]

Doğu Akdeniz Bölgesinde ağaçlı otlak bir meşe ormanının saproksilik böcek türleri ve Türkiye entomofaunasına katkılar

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Abstract

This research was conducted to investigate the saproxylic Coleoptera fauna found in oak trees of different ages in Mersin/Gülnar in the Eastern Mediterranean Region in 2017. Fourty-five window traps were used to sample the beetles on the oak trees. Traps were checked five times, once a month, from June to October. In total, 13 217 individuals from the order Coleoptera were collected and 242 saproxylic beetle species belonging to 44 families were found. In the material, 33 beetle species were identified as new records for the Turkish fauna. Most beetle species were from the Buprestidae (24 species), Anobiidae (23 species) and Tenebrionidae (18 species) families. The highest numbers of individuals were from the Dermestidae (2 354), Elateridae (2 325) and Curculionidae (1 531) families. The highest number of individuals were *Xyleborus dryographus* (Ratzeburg, 1837) (Curculionidae) and *Cardiophorus* (*Cardiophorus*) *parvulus* Platia & Gudenzi, 2000 (Elateridae) with 1 109 individuals each. Three species were found; namely *Protaetia* (*Eupotosia*) *mirifica (*Mulsant, 1842), *Chromovalgus peyroni* (Mulsant, 1852) (Cetonidae) and *Propomacrus bimucronatus* (Pallas, 1781) (Euchiridae), which appear on the IUCN European and Mediterranean red list as Vulnerable (VU).

Keywords: Mersin, *Quercus* spp., saproxylic beetles, species diversity, wooded pasture

Öz

Doğu Akdeniz Bölgesinde Mersin/Gülnar'da yapılan bu çalışma meşe ormanlarında saproksilik Coleoptera türlerinin belirlenmesi amacıyla 2017 yılında yürütülmüştür. Alanda 45 pencere tipi böcek tuzağı asılmıştır. Tuzaklar haziran-ekim döneminde ayda bir kez olmak üzere beş kez kontrol edilmiştir. Coleoptera takımından 13 217 adet saproksilik böcek toplanmış ve 44 familyaya ait 242 adet tür saptanmıştır. Bu türlerden 33'ünün Türkiye saproksilik Coleoptera faunası için yeni kayıt olduğu belirlenmiştir. En fazla böcek türü sırasıyla Buprestidae (24 tür), Anobiidae (23 tür) ve Tenebrionidae (18 tür) familyalarından elde edilmiştir. En fazla birey ise sırasıyla Dermestidae (2 354 adet), Elateridae (2 325 adet) ve Curculionidae (1 531 adet) familyalarından tespit edilmiştir. Birey sayısı en fazla olan türler 1109 adet ile *Xyleborus dryographus* (Ratzeburg, 1837) (Curculionidae) ve *Cardiophorus (Cardiophorus*) *parvulus* Platia & Gudenzi, 2000 (Elateridae) olmuştur. *Protaetia (Eupotosia*) *mirifica* (Mulsant, 1842) *Chromovalgus peyroni* (Mulsant, 1852) (Cetonidae) ve *Propomacrus bimucronatus* (Pallas, 1781) (Euchiridae) IUCN'in Avrupa ve Akdeniz kırmızı listesinde nesli tehdit altında olan Duyarlı (VU) sınıfında yer almaktadır.

Anahtar sözcükler: Mersin, *Quercus* spp, saproksilik böcekler, tür çeşitliliği, ağaçlı otlak

[1] This study was supported by Suleyman Demırel University, Scientific Research Unit, Türkiye, Grant Project No: 4671-D2-16.
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Received (Alınış): 10.01.2023 Accepted (Kabul ediliş): 02.07.2023 Published Online (Çevrimiçi Yayın Tarihi): 17.07.2023

Introduction

In the forests of Türkiye, there are 17 oak species (*Quercus* spp.), four of which are endemic [*Q. vulcanica* (Boiss. Heldr. ex) Kotschy, *Q. macranthera* Fisch. & C. A. Mey. ex Hoh. subsp. *syspirensis* (C. Koch.) Menitsky, *Q. trojana* subsp. *yaltirikii* Ziel. et al. and *Q. aucheri* Jaub. et Spach.]. Including subspecies and varieties, there 24 taxa in total (Yılmaz, 2018). The broad-leaved forests of Türkiye cover an area of approximately seven million hectares (GDF, 2022).

An old oak tree can house hundreds of different species, especially fungi, insects and birds. As the tree ages, and the number of micro habitats, including dead twigs and branches, increase on the tree, additional species can colonize the tree. Initiation of decay by fungi starting in the tree trunk is an important factor in increasing the number of habitats. Wood, softened by fungal activities, becomes accessible to insect larvae and woodpeckers that create cavities. In the bottom of these cavities, which are usually sheltered from rain, organic matter from the tree accumulates and turns into compost. This material is often dominated by wood pieces and fungal remains, and over time becomes wood mould. The compost can also contain insect larva frass and waste from other insects and birds living in the cavities, thus the compost in different cavities may become varied and form unique mixtures (Dajoz, 1980; Micó, 2018). In hollow trees inhabited by saproxylic insects, there is a succession of fauna during the process of decay and decomposition (Speight, 1989), but the cavities in combination with this mixture can constitute a stable environment for many species in an old oak for hundreds of years (Ranius, 2002; Ranius et al., 2009). Oaks with decay cavities are used as indicators of high biological diversity and areas with a rich saproxylic beetle fauna often have a long historical continuity of old trees (Speight, 1989; Warren & Key, 1989; Buse, 2012). Saproxylic beetles are insects that depend on dead and decaying wood for at least part of their lifecycle and play important ecological roles in European habitats. Some species living in old and dead trees and in rotten wood in cavities are on the European and Mediterranean red list (Nieto & Alexander, 2010; Avgın et al., 2014; Calix et al., 2018; Garcia et al., 2018). The current IUCN European Red List provides an assessment of 693 species of saproxylic beetles. Overall, 17.9% and 21.7% of species are considered threatened in Europe and in the EU, respectively (Calix et al., 2018). 61 species of the 320 saproxylic beetles evaluated are threatened in the Mediterranean region, 29 species are Near Threatened and 131 species are Data Deficient (Garcia et al., 2018).

Saproxylic insect species living on old trees are considered an important group of highly endangered invertebrates in all of Europe, since their principal habitat has decreased. It is known that the presence of these insects in the forest directly and positively affects other forest species (McLean & Speight, 1993), but also provides important ecosystem services related to the decomposition of wood, nutrient cycling, forest pest control and pollination (Ulyshen, 2016; Micó, 2018; Ulyshen, 2018). In fact, some of these insects are considered indicator species during the establishment of protected areas. Studies conducted in the south of Türkiye also showed that the historical process of pruning these trees or their growth under natural conditions have no negative impact on the diversity of insects living in this mixture (Avcı et al., 2010a).

Saproxylic beetle communities in old oaks have also been examined in other Mediterranean countries in recent years. Several research programmes on ecology and biodiversity conservation have been conducted, and they have, in particular, focused on the saproxylic beetles guild (Buse et al., 2008; Sirami et al., 2008; Quinto et al., 2012, 2014, 2015; Ramírez-Hernández et al., 2014; Micó et al., 2015, 2020; Ramilo et al., 2017; Sanchez-Galvan, 2018; Della Rocca et al., 2022). There are indications that the beetle fauna of oak trees in Türkiye is richer than those occurring in many European countries and that it is also richer than all Northern European countries combined (Jansson et al., 2010). In recent studies of old oaks in the Aegean and Mediterranean part of Türkiye, overy 32 newly recognised species have been found (Schillhammer et al., 2007; Novak et al., 2011; Platia et al., 2011; Sama et al., 2011; Jansson, 2021). The most species-rich of the studied families are Elateridae, Buprestidae and Dermestidae with 51, 35 and

34 species respectively (Jansson, 2021). New beetle species were found living on old trees with dead branches and trunk cavities. These invertebrates are at the bottom of the food chain and are an important factor for many other species, especially birds such as woodpeckers (Sunnergren, 2008). Hollow trees have a range of crucial roles in society: they are valuable historically, culturally and aesthetically at a landscape level and for recreational purposes. People tend to be naturally attracted to old hollow trees, as demonstrated by the enhancement of monumental trees in different countries that are visited by thousands of tourists every year. These cultural and aesthetic values could be combined with the intrinsic biological importance of these trees that act as keystone structures for diversity conservation (Müller et al., 2013). Old oak trees in Türkiye are an important and unique heritage for the world. With increased knowledge of saproxylic beetles living in these trees, the importance of role of Turkish forests in global biodiversity will be enhanced.

The aim of the study was to examine and describe the saproxylic beetle fauna in oak-dominated wooded pastures in Mersin/Gülnar in the Eastern Mediterranean Region and to report scientific information useful for the motivation of the future preservation of this area.

Materials and Methods

Study area

The study area is located on the Taşeli Plateau, to the north and east of the Köseçobanlı village neighborhood, in the Gülnar district, Mersin Province (centre point: 36º27'53"N-33º09'40"E). The area of the plateau with similar habitat was approximately 4 400 hectares (ha) at an altitude of 1300-1602 meters (Figure 1). The whole area consisted of wooded pastures with scattered pollarded oaks (35-55 oaks/ha) mainly grazed by goats. The oaks form part of an ancient herding system with goat and sheep herding where oak foliage is an essential component of the fodder for the animals. In the Turkish forest management classification system, this type of habitat is classified as degraded oak (BM). The oak species in the area were mainly *Quercus ithaburensis* with some *Q. libani* and *Q. infectoria* and a few ash, *Fraxinus angustifolia* Reut. (Lamiales: Oleaceae). The total size of the studied areas was approximately 10.7 ha. Areas with almost pure oak forest were selected based on high abundance of old and hollow trees.

Figure 1. The location of study area.

Study material

Window traps were used to collect beetles (Figure 2). When setting up the traps, two one-meter-long wooden battens, one 30 x 50 cm transparent plexiglass sheet, one 15 x 15 x 30 cm metal container, nails, nylon rope and wire were used to attach each trap on the tree trunks (Jansson & Lundberg, 2000).

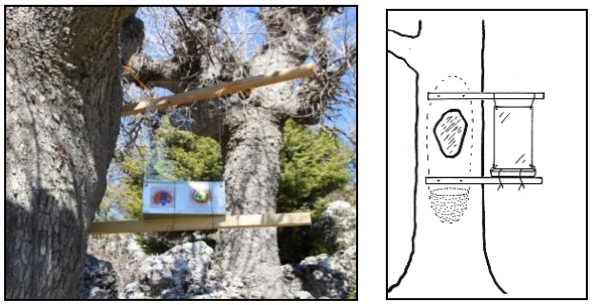

Figure 2. The window trap used to collect the saproxylic beetles.

In the laboratory, the beetles were separated in a 15 x 30 x 50 cm white plastic container into plastic cups, filtered with the help of a 15-cm-diameter wire strainer (0.5 mm mesh width), and were examined under a 16-40X magnification of Olympus SZ-CTV and Nikon C-LEDS microscopes. Insects were preserved in 70% ethyl alcohol in 1.5 ml Eppendorf tubes or 50 ml falcon tubes. Insect needles, forceps, Petri dishes, insect glue and insect sticking paper mounting boards were used.

Study design

In the study, 45 insect traps were set in oak stands containing trees of different ages. If the trees were hollow, traps were placed opposite the hollow entrance to the tree. While setting up the traps, attention was focused on keeping the trap parallel to the tree or vertical to ensure the stability of the trap. The trap was kept at an average of 1-3 meters above the ground.

After the traps were mounted on the trees, one liter of antifreeze and an average of one liter of water were added into each metal container. Subsequently, a small amount of detergent was added to reduce surface tension. The coordinates of the trapped trees were recorded with the help of a GPS device.

The traps were mounted on the trees on 28-29 April 2017 and were checked at monthly intervals until mid-October 2017. At each visit, the traps were examined individually, and the caught insects were filtered from the antifreeze water with a strainer and placed in plastic cups. At the end of this process, the liquid levels of the traps were checked, and the antifreeze and water levels were topped up to the original volume.

Separation of the insects in the laboratory, preparation, and the identification process

The insects collected from each sample were decanted into a white plastic tray (50 x 30 x 10 cm) after which water was added to the tray. Beetles were sorted without magnification under strong light according to their size and were stored in plastic tubes containing 70% alcohol. Labels with the date the insect was collected, the trap number and the coordinates were placed on each tube.

In the next step, separation into families was carried out using both an identification key and help from different experts. Subsequently, larger species were pinned, and small species were glued to paper mounting boards with water-based glue. After the preparation process, the general appearance was recorded along with identification photographs of the beetles produced with a LEICA Z16 APO binocular fitted in a Nikon D7000 camera.

The identifications of the specimens obtained in the study were partly made by the authors, but most were made by specialists.

In addition, the IUCN category classification of the species (Akçakaya & Ferson, 2001) was recorded. Classification of the saproxylic beetles according to their feeding patterns and their locations in the tree followed the methods of Carpaneto et al. (2015) with some minor adjustments (Table 1).

When examining if an identified species was previously recorded in Türkiye, the following publications were used: Löbl & Smetana (2006, 2007, 2008, 2010, 2011, 2013); Avgın et al. (2014); Koçak (2014); Löbl & Löbl (2015, 2016, 2017); Gülperçin & Tezcan (2016); Alonso-Zarazaga et al. (2017) and Tezcan (2020).

Table 1. Trophic categories of saproxylic insects (Carpaneto et al., 2015)

Abbreviations	Trophic category
CO	Commensal of SX/XY or of other saproxylic insects
MB	Mycetophagous on carpophora of macrofungi (mostly Polyporales) growing on veteran trees or on old stumps
MM	Myrmecophilous or melittophagous inside hollow trees or stumps hosting colonies of ants or other social Hymenoptera
MY	Mycophagous (on hyphae of saproxylic fungi or on micromycetes, yeasts and Myxomyceta)
NI	Commensal in bird or small mammal nests, feeding on parts of dead animals including other insects inside hollow trees or other cavities in dead wood
PR	Predator (as larvae or imagoes) of SX/XY or of other saproxylic insects
SF	Feeding on fermented sap and exudates (usually including a mixture of bacteria and yeasts) produced by trees attacked by XY, fungi or wounded by external physical agents
SP	Saprophytophagous on rotting vegetal matter associated with dead wood and wood debris
SX	Saproxylophagous in dead wood during the whole process of decomposition, including wood mould inside hollow trees
UN	Trophic category unknown
XY	Xylophagous (fresh wood or bark but also developing on healthy trees)

Results and Discussions

In total, 13 217 individuals of saproxylic beetles representing 242 species in 44 families were identified. Of these species, 33 species were identified as new records for the fauna of Türkiye. While most of the species were from the Buprestidae family with 24 species, the highest number of individuals were from the Dermestidae family (n=2 354) (Figure 3). The species found, numbers of individuals per species, IUCN (Europe and Mediterranean) red list category and the classification of the saproxylic beetles according to their feeding guilds (trophic strategy) are given in Appendix Table 1. Trophic categories of 228 of the 242 species obtained in the study were classified.

When comparing numbers of species per family, the three richest families were Buprestidae (n=24), Anobiidae (n=23) and Tenebrionidae (n=18) (Figure 4).

The families with the highest number of individuals in this study were Dermestidae with 2 354 individuals, Elateridae with 2 325 individuals and Curculionidae with 1 531 individuals (Figure 5).

When the number of individuals of the newly recorded species was compared, *Mordellistena neuwaldeggiana* (Panzer, 1796), of the Mordellidae family, was most abundant with 155 individuals. The second highest number of individuals was of *Clypeorhagus clypeatus* (Hampe, 1850) from the Eucnemidae family, followed by *Anthocomus semipolitus* (Abeille de Perrin, 1882) of the Malachiidae family, with 36 individuals.

Atay et al. (2012a) conducted a smaller study of saproxylic beetles (Coleoptera) on old oak trees in Adana-Kozan, Türkiye, and found 11 families, 32 genera and 40 species. Species richness, in terms of most represented family, was similar to the results reported in the present study (Elateridae, Buprestidae and Scarabaeidae). In other work, Atay et al. (2012b) identified 87 coleopteran species from 18 families in the same region. The families with most species were Elateridae, Anobiidae and Tenebrionidae, which were among the first five families with the highest numbers of species identified in the present study.

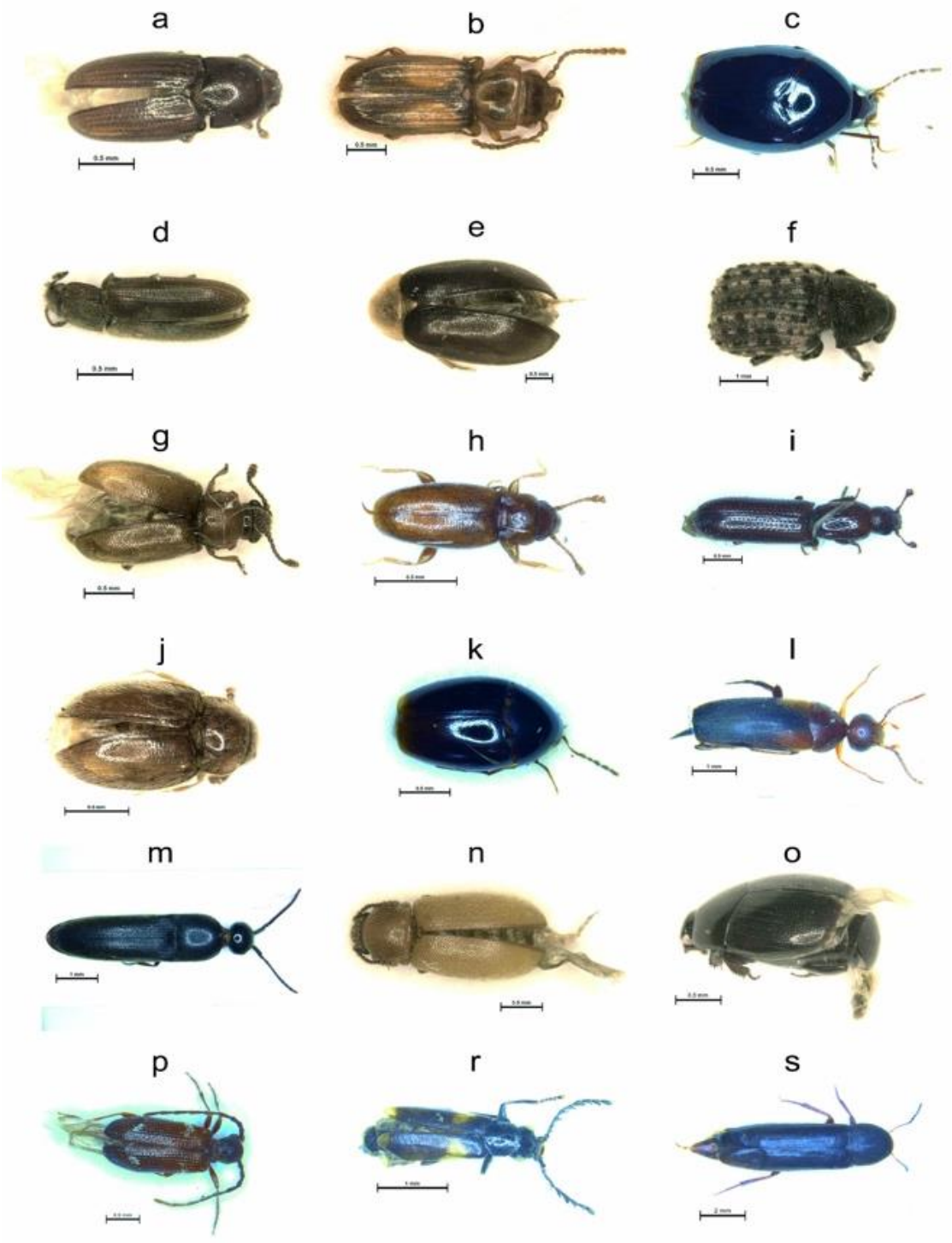

Figure 3. Examples of new species for the saproxylic insect fauna of Türkiye: a) *Cerylon histeroides*, b) *Laemophloeus monilis*, c) *Scaphisoma agaricinum*, d) *Diplocoelus fagi*, e) *Sacodes flavicollis*, f) *Anthribus nebulosus*, g) *Cryptophagus quercinus*, h) *Holoparamecus* (*Calyptobium*) *caularum*, i) *Oxylaemus cylindricus*, j) *Symbiotes gibberosus*, k) *Scaphisoma subalpinum*, l) *Mordellistena* (*Mordellistena*) *neuwaldeggiana*, m) *Clypeorhagus clypeatus*, n) *Atomaria* (*Atomaria*) *slavonica*, o) *Gnathoncus buyssoni*, p) *Ptinus* (*Gynopterus*) *diversipennis*, r) *Nepachys amaenus*, s) *Phloiotrya* (*Phloiotrya*) *rufipes*.

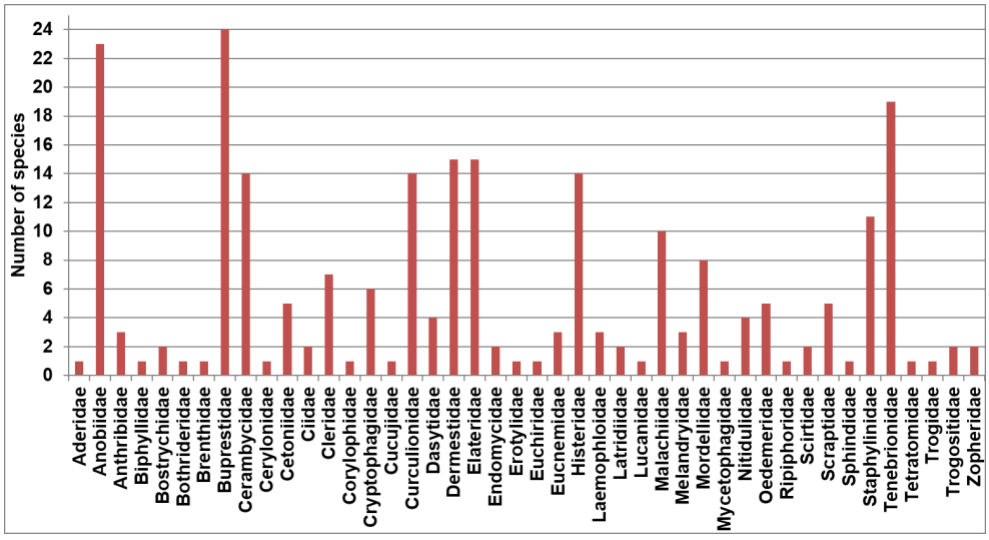

Figure 4. The number of species per family.

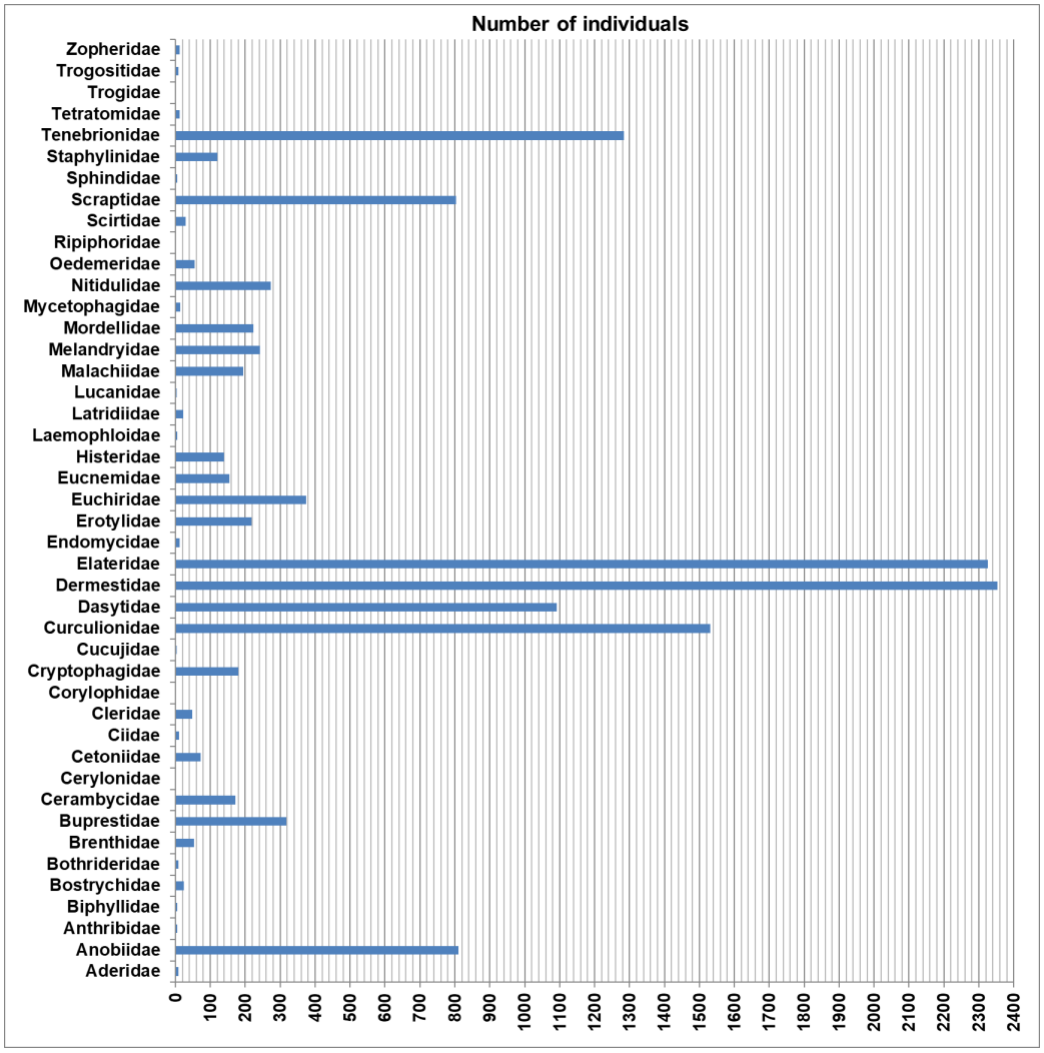

Figure 5. The number of individual beetles found per family.

A literature review conducted by Avgin et al. (2014) suggested that 151 saproxylic beetle species in eight families were present in Türkiye, showing that the families Cerambycidae, with 77 species, and Elateridae, with 46 species, were the most important families in terms of the number of species. In the present study, these two families were also amongst the most prevalent in terms of the number of species as the Cerambycidae family was represented by 14 species and the Elateridae family was represented by 15 species.

Laz (2015) found 2 323 individuals and 82 species in a study conducted in three different forests in the Kahramanmaraş/Andırın region. The results from the study's oak habitat have indicated that the highest numbers of species were in the Elateridae and Buprestidae families, a finding also matched in that of the present work.

Old oaks (*Quercus petraea* (Matt.) Liebl., *Q. frainetto* Ten. and *Q. frainetto* x *Q. petraea*) in the Kaz Dağları (Balıkesir-Edremit Bay) and Kapıdağ Peninsulas (Balıkesir-Erdek) were examined by Varlı et al. (2019). Anobiidae, Cerambycidae, Tenebrionidae and Scraptiidae were the richest families in terms of the number of species in the Kapıdağ Peninsula and Elateridae, Cerambycidae, Tenebrionidae and Anobiidae the richest families in terms of number of species in the Kaz Mountains. Again, these results were similar to those reported in the present study, with the exception of the Scraptiidae family.

The two most common species in this study were the curculionid *Xyleborus dryographus* species (Ratzeburg, 1837) from the Scolytinae subfamily and the elaterid *Cardiophorus* (*Cardiophorus*) *parvulus* species (Platia & Gudenzi, 2000) from the *Cardiophorinae* subfamily. For both species, 1 109 individuals were trapped. The next most abundant species was the dermestid *Ctesias maculifasciata* (Reitter, 1899) with 990 individuals. Previous studies have also shown that *X. dryographus* is a common species in old oak forests as larval development occurs under the bark of dead branches. The old trees in the present study area, therefore, provided a good habitat.

Sarıkaya (2013) obtained eight Scolytinae subfamily species in a study conducted with red sticky traps in the *Quercus cerris* forests of the Aksu province of Isparta province. The most collected species was *Xyleborinus saxesenii* (Ratzeburg, 1837), but only three individuals from the *Xyleborus dryographus* species were obtained. In further studies conducted in the oak (*Q. vulcanica)* forest in the Isparta Kasnak Oak Nature Reserve, eight species of the Scolytinae subfamily were recorded, with the *X. saxesenii* species being the most abundant (Sarıkaya & Sayın, 2016). While nine species from the Scolytinae subfamily were obtained in the present study, the *X. saxesenii* species was not detected.

From the 242 beetle species identified in this study, 22 species from four categories have been red listed by the IUCN. A total of 17 species were classified with eight species from the Cerambycidae family, two species from the Trogositidae family, and one species each from the Bostrichidae, Cetoniidae, Elateridae, Erotylidae, Eucnemidae, Lucanidae and Mycetophagidae families in at least the concern category (LC).

In total, two species found in the present study are listed on the red list, namely the *Megapenthes lugens* (L. Redtenbacher, 1842) (Coleoptera: Elateridae) and *Cerambyx cerdo* (L., 1758) (Coleoptera: Cerambycidae), and were assessed as near threatened (NT). *Protaetia mirifica* (Mulsant, 1842) (Coleoptera: Cetonidae) and *Propomacrus bimucronatus* (Pallas, 1781) (Coleoptera: Euchiridae) were classified in the Vulnerable (VU) category. The other identified species were classified as data deficient (DD) (the *Reitterelater dubius* species in the Elateridae family).

For trophic category classification, 228 of the 242 species were assessed and categorised. In some families, such as the Buprestidae, Cerambycidae and Mordellidae, the species had a uniform feeding pattern and were classified into the same single category (XY: Xylophagous), but the species in other families such as the Cryptophagidae (MY: Mycophagous, MB: Mycetophagous, SP: Saprophytophagous,

NI: feeds on dead insects and other animal parts in cavities), Laemophloeidae (MY, SX: Saproxylophagous) and Tenebrionidae (SX, MB, MY, PR: Predator) families had more mixed feeding patterns and were, therefore, placed in many different categories. Most of the species were classified into the trophic XY category, developing in fresh wood or bark but some also thrived on healthy trees.

This study confirmed that old oaks are a highly valuable, important habitat and support the status of Türkiye as a key biodiverse hot spot. At the same time, it is clear that further research is needed to expand knowledge of the biodiversity of old oaks in Türkiye. The records of many species that are rare and threatened in Europe show the high value of the oak habitat for biodiversity conservation as well as the importance for future scientific research. Earlier studies on birds showed that oak habitats in Türkiye supported a rich and diverse fauna, including several species of European conservation concern (Bergner et al., 2015). To preserve the important biological hot spots and structures in wood producing areas, it is crucial to implement an ecosystem-based management approach as well as an appropriate management protocol for these species in protected areas and across the entire forest landscape. Since many beetles are a key food source for woodpeckers and other insectivorous birds, conservation work is also important for the protection of insectivorous birds (Bergner et al., 2015; Kalay Göktepe et al., 2019).

Taking shoots and branches with foliage from trees for animal grazing fodder has been a traditional livelihood representing a cultural heritage practiced in Türkiye for at least two thousand years (Kaniewski et al., 2007), although similar techniques were used throughout Europe until a century ago. It has been suggested that pollarding is a valuable management strategy and an important driver for the creation of microhabitats needed by saproxylic organisms (Sebek et al., 2013; Quinto et al., 2014). The results presented in this study show that this tradition has created a rich habitat for wood-living beetles on the Taşeli plateau. It is, therefore, essential to maintain traditional management in some larger areas with pollarded (pruned) oaks, as in the studied area, of different climatic zones to preserve the unique biodiversity associated with oak trees in Türkiye. It is essential that natural and old oak forests in Türkiye are treated with methods most suitable to encourage biodiversity and that as great an area of these forests as possible is a priority for protection to preserve all the richness of the ecosystem for future generations.

Acknowledgement

We would like to thank Adam Bergner and Mustafa Önder Ersin for their contributions to the work with the traps in the field, Şükran Oğuzoğlu for helping with the sorting and classification of the beetle material and Stanislav Snäll for help with some of the identifications of the beetles in our lab. We also thank the Süleyman Demirel University for their financial support with Project No. 4671-D2-16. The Gülnar forest management directorate provided useful assistance with transportation and field guidance.

Also, thanks to: Vladimír Novák (Alleculinae), Thomas Barnouin (Anobiidae), Andrei Legalov (Anthribidae), Jerzy Borowski (Bostrichidae), Prof. Dr. Göksel Tozlu (Buprestidae), Pierpaolo Rapuzzi (Cerambycidae), Roman Królik (Ciidae), Vitaly Alekseev (Corylophidae), Jose Carlos Otero Gonzalez, Lyubarsky Georgy (Cryptophagidae), Mahmut Erbey (Curculionidae), Gianfranco Liberti (Dastyidae), Jiří Háva (Dermestidae), Giuseppe Platia, Mahmut Kabalak (Elateridae), Sławomir Mazur (Histeridae), Alessandro Bruno Biscaccianti (Laemophloeidae), Jan Růžička (Leiodidae), Robert Constantin (Malachiidae), Enrico Ruzzier (Scraptiidae and Mordellidae), Josef JelineK (Nitidulidae), Miloš Knižek (Platypodinae and Scolytinae), Jerzy Borowski (Ptininae), Andrei Legalov (Rhynchitidae), Jan Batelka (Ripiphoridae), Ivan Lobl (Scaphidiinae), Marco Uliana, Stefano Ziani (Scarabeidae), Rafal Ruta (Scirtidae), Roman Królik (Sphindidae), Sinan Anlaş (Staphylinidae), Fabien Soldati and Bekir Keskin (Tenebrionidae) for identification of the beetles.

References

Akçakaya, H. R. & S. Ferson, 2001. RAMAS® Red List: Threatened Species Classifications under Uncertainty. Version 2.0. Applied Biomathematics, New York, 119-121.

Alonso-Zarazaga, M. A., H. Barrios, R. Borovec, P. Bouchard, R. Caldara, E. Colonnelli, L. Gültekin, P. Hlaváþ, B. Korotyaev, C. H. C. Lyal, A. Machado, M. Meregalli, H. Pierotti, L. Ren, M. Sánchez-Ruiz, A. Sforzi, H. Silfverberg, J. Skuhrovec, M. Trýzna, A. J. Velázquez de Castro & N. N. Yunakov, 2017. Cooperative Catalogue of Palaearctic Coleoptera Curculionoidea. Monografías Electrónicas SEA 8 Sociedad Entomológica Aragonesa S.E.A., Zaragoza (Spain), 729 pp.

Atay, E., N. Jansson & T. Gürkan 2012. Saproxylic beetles on old hollow oaks (*Quercus* spp.) in a small isolated area in southern Turkey: Zoology in the Middle East, (Insecta: Coleoptera). 57 (1): 105-114.

Avcı, M., N. Jansson, M. Coşkun & O. Sarıkaya, 2010a. "The situation for the oak forests in Turkey and suggestions fot future management, 37". The Oak-Ecology, History Management and Planning II, (June 01-03, Isparta, Turkey), 130 pp.

Avgın, S. S., İ. Dertli & A. Barševskis, 2014. A review of Turkish saproxylic beetles from the European Red List. Journal of Entomological Science, 50 (1): 13-50.

Bergner, A., M. Avcı, H. Eryiğit, N. Jansson, M. Niklasson, L. Westerberg & P. Milberg, 2015. Influences of forest type and habitat structure on bird assemblages of oak (*Quercus* spp.) and pine (*Pinus* spp.) stands in southwestern Turkey. Forest Ecology and Management, 336: 137-147.

Buse, J., T. Levanony, A. Timm, T. Dayan & T. Assmann, 2008 Saproxylic beetle assemblages of three managed oak woodlands in the Eastern Mediterranean. Zoology in the Middle East, 45 (1): 55-66.

Cálix, M., K. N. A. Alexander, A. Nieto, B. Dodelin, F. Soldati, D. Telnov, X. Vazquez-Albalate, O. Aleksandrowicz, P. Audisio, P. Istrate, N. Jansson, A. Legakis, A. Liberto, C. Makris, O. Merkl, R. Mugerwa Pettersson, J. Schlaghamersky, M. A. Bologna, H. Brustel, J. Buse, V. Novák & L. Purchart, 2018. European Red List of Saproxylic Beetles. Brussels, Belgium: IUCN, 12 pp.

Carpaneto, G. M., C. Baviera, A. B. Biscaccianti, P. Brandmayr, A. Mazzei, F. Mason, A. Battistoni, C. Teofili, C. Rondinini, S. Fattorini & P. Audisio, 2015. A red list of Italian saproxylic beetles: taxonomic overview, ecological features, and conservation issues (Coleoptera). Fragmenta Entomologica, 47 (2): 53-126.

Dajoz, R., 1980. Ecologie des Insectes Forestiers. Paris, Gauthier-Villars. 489 pp (in French).

Della Rocca, F., N. Jansson, S. Chiari, A. Zauli & G. M. Carpaneto, 2022. Micro-habitat drivers of saproxylic beetle assemblages in old woodlands of Mediterranean cork oak (*Quercus suber*). Agricultural and Forest Entomology, 25 (1): 77-90.

Garcia, N., C. Numa, L. Bartolozzi, H. Brustel, J. Buse, M. Norbiato & G. Eduardo, 2018. The conservation status and distribution of Mediterrenean saproxylic beetles. Malaga, İspanya: IUCN, XII + 58 pp.

GDF (General Directorate of Forestry), 2022. Statistics of forestry 2021. General Directorate of Forestry. (Web page: https://www.ogm.gov.tr/tr/e-kutuphane/resmi-istatistikler) (Date accessed: January 2023) (in Turkish).

Gülperçin, N. & S. Tezcan, 2016. Türkiye orman ekosistemlerinin Elateridae (Insecta: Coleoptera) faunası üzerinde bir değerlendirme. Bartın Orman Fakültesi Dergisi, 18 (1): 132-144 (in Turkish).

Jansson, N. & M. Coskun, 2008. How similar is the saproxylic beetle fauna on old oaks (*Quercus* spp.) in Turkey and Sweden? Revue d'Ecologie (Terre et Vie) Supplement, 10: 91-99.

Jansson, N. & S. Lundberg, 2000. Beetles in hollow broadleaved deciduous trees-two species new to Sweden and the staphylinid beetles (Coleoptera: Staphylinidae) *Hypnogyra glabra* and *Meliceria tragardhi* found again in Sweden. Entomologisk Tidskrift, 121: 93-97.

Jansson, N., 2021. The unknown Turkish oak landscapes-A threatened biological culture heritage, Winter/Spring 2021, No. 9: 3-18.

Kalay Göktepe, M., A. Bergner, S. Göktepe, P. Milberg, N. Jansson & M. Avcı, 2019. Fine-scale habitat utilization by birds in an ancient oak (*Quercus* spp.) wood-pasture in southwestern Turkey. Turkish Journal of Forestry, 20 (1): 1-7.

Kaniewski, D., V. De Laet, E. Paulssen & M. Waelkens, 2007. Long-term effects of human impact on mountainous ecosystems, western Taurus Mountains, Turkey. Journal of Biogeography, 34: 1-23.

Koçak, A., 2014. List of the 23773 pterygot species in Turkey based upon the info-system of the Cesa. Priamus, 32: 1-876.

Laz, B., 2015. Kahramanmaraş İli Andırın İlçesinde 3 Farklı Orman Tipinde Bazı Coleoptera Familyalarının Çeşitliliği Üzerine İncelemeler. Kahramanmaraş Sütçü İmam Üniversitesi Fen Bilimleri Enstitüsü (Unpublished) PhD Thesis) Kahramanmaraş, 178 s (in Turkish with abstract in English).

Löbl, I. & A. Smetana, 2006. Catalogue of Palaearctic Coleoptera. Volume 3. Scarabaeoidea- Scirtoidea- Dascilloidea-Buprestoidea- Byrrhoidea. Stenstrup, Denmark: Apollo Books, 61 (3): 427-428.

Löbl, I. & A. Smetana, 2007. Catalogue of Palaearctic Coleoptera. Volume 4. Elateroidea-Derodontoidea- Bostrichoidea-Lymexyloidea-Cleroidea-Cucujoidea. Apollo Book, Stenstrup, 935 pp.

Löbl, I. & A. Smetana, 2008. Catalogue of Palaearctic Coleoptera, Volume 5. Tenebrionoidea. Stenstrup, Denmark: Apollo, 337 pp.

Löbl, I. & A. Smetana, 2010. Catalogue of Palaearctic Coleoptera. Volume 6. Chrysomeloidea. Apollo Book, Stenstrup, 924 pp.

Löbl, I. & A. Smetana, 2011. Catalogue of Palaearctic Coleoptera, Volume 7. Curculionoidea I. Stenstrup: Apollo Books, 373 pp.

Löbl, I. & A. Smetana, 2013. Family Curculionidae II. Catalogue of Palaearctic Coleoptera. Apollo Books, Stenstrup, 700 pp.

Löbl, I. & D. Löbl, 2015. Catalogue of Palaearctic Coleoptera. Volume 2. Hydrophiloidea-Staphylinoidea. Revised and Updated Edition. Brill, Leiden, Boston, 1702 pp.

Löbl, I. & D. Löbl, 2016. Catalogue of Palaearctic Coleoptera. Volume 3. Scarabaeoidea-Scirtoidea-Dascilloidea-Buprestoidea-Byrrhoidea. Revised and Updated Edition. Brill, Leiden, Boston, 983 pp.

Löbl, I. & D. Löbl, 2017. Catalogue of Palaearctic Coleoptera. Volume 1. Archostemata-Myxophaga-Adephaga. Revised and updated edition. Brill, Leiden, Boston, 1443 pp.

McLean, I. F. G. & M. C. D. Speight, 1993. “Saproxylic Invertebrates-The European Context, 21-32”. In: Dead Wood Matters: The Ecology and Conservation of Saproxylic Invertebrates in Britain (Eds. K. J. D. & C. M. Drake). English Nature Science, 89 pp.

Micó, E., 2018. “Saproxylic Insects in Tree Hollows, 693-727”. In: Saproxylic Insects. Springer 904 pp.

Micó, E., A. García-López, A. Sánchez, M. Juárez & E. Galante, 2015. What can physical, biotic and chemical features of a tree hollow tell us about their associated diversity? Journal of Insect Conservation, 19: 141-153.

Micó, E., P. Ramilo, S. Thorn, J. Muller, E. Galante & C. P. Carmona, 2020 Contrasting functional structure of saproxylic beetle assemblages associated to different microhabitats. Scientific Reports, 10 (1): 1-11.

Nieto, A. & K. N. A. Alexander, 2010. European Red List of Saproxylic Beetles. Luxembourg: Publications Office of the European Union, 89 pp.

Novák, V., N. Jansson, M. Avcı, O. Sarıkaya, M. Coskun, E. Atay & T. Gürkan, 2011. New *Allecula* species (Coleoptera: Tenebrionidae: Alleculinae) from Turkey. Studies and Reports Taxonomical Series, 7 (1-2): 335-346.

Nabozhenko, M. & Keskin, B. 2016. Revision of the genus *Odocnemis* Allard, 1876 (Coleoptera: Tenebrionidae: Helopini) from Turkey, the Caucasus and Iran with observations on feeding habits, Zootaxa, 4202 (1): 1-97.

Quinto, J., E. Mico, A. P. Martínez-Falcón, E. Galante & M. A. Marcos-García, 2014. Influence of tree hollow characteristics on the diversity of saproxylic insect guilds in Iberian Mediterranean woodlands. Journal of Insect Conservation, 18: 981-992.

Quinto, J., M. A. Marcos-García, C. Díaz-Castelazo, V. Rico-Gray, H. Brustel, E. Galante & E. Micó, 2012. Breaking down Complex Saproxylic Communities: Understanding Sub-Networks Structure and Implications to Network Robustness. PLoS ONE 7 (9): e45062.

Quinto, J., M.A. Marcos-García, C. Díaz-Castelazo, V. Rico-Gray, E. Galante & E. Micó, 2015. Association Patterns in Saproxylic Insect Networks in three Iberian Mediterranean Woodlands and their resistance to microhabitat Loss. PLoS ONE, 10 (3): e0122141.

Platia, G., N. Jansson, M. Avci, O. Sarikaya, M. Coskun & T. Kayis, 2011. New species of click beetles from Turkey (Coleoptera, Elateridae). Boletín de la Sociedad Entomológica Aragonesa, 48: 207-215.

Ramilo, P., A. Martinez-Falcón, A. García-López, H. Brustel, E. Galante & E. Micó, 2017. Influence of Traditional Management and Environmental Variables on Mediterranean Saproxylic Beetle Assemblages. Environmental Entomology, 46 (6): 1235-1242.

Ramírez-Hernández, A., E. Micó, M. A. Marcos-García, H. Brustel, A. Padilla & E. Galante, 2014. The "dehesa", a key ecosystem in maintaining the diversity of Mediterranean saproxylic insects (Coleoptera and Diptera: Syrphidae). Biodiversity Conservation, 23: 2069-2086.

Ranius, T., 2002. Influence of stand size and quality of tree hollows on saproxylic beetles in Sweden. Biological Conservation, 103 (1): 85-91.

Ranius, T., G. P. Svensson, N. Berg, M. Niklasson, M. C. Larsson, 2009. The successional change of hollow oaks affects their suitability for an inhabiting beetle, *Osmoderma eremita*. Annales Zoologici Fennici, 46: 205-216.

Sama, G., N. Jansson, M. Avci, O. Sarikaya, M. Coskun, T. Kayis & H. Özdikmen, 2011. Preliminary report on a survey of the saproxylic beetle fauna living on old hollow oaks (*Quercus* spp.) and oak wood in Turkey. Munis Entomology and Zoology, 6: 819-831.

Sama, G., N. Jansson, M. Avcı, O. Sarıkaya, M. Coşkun, T. Kayış & H. Özdikmen, 2011. Preliminary report on a survey of the saproxylic beetle fauna living on old hollow oaks (*Quercus* spp.) and oak wood in Turkey Coleoptera: Cerambycidae). Munis Entomology & Zoology, 6 (2): 819-831.

Sanchez-Galvan, I. R., M. A. Marcos-García, E. Galante, E. T. Azeria & E. Micó, 2018. Unraveling saproxylic insect interactions in tree hollows from Iberian Mediterranean Forest. Environmental Entomology, 47: 300-308.

Sarıkaya, O. & H. Sayın, 2016. Use of the red winged sticky traps for collecting bark and ambrosia beetles [Scolytinae (Coleoptera: Curculionidae)] on deciduous trees of Kasnak oak nature protection area in Isparta, Turkey. Research Journal of Biotechnology, 11 (9): 79-85.

Sarıkaya, O., 2013. Bark and ambrosia beetles collected from Turkey oak (*Quercus cerris*) forests in Isparta province of Turkey. Journal of Animal and Veterinary Advances, 12 (11): 1038-1043.

Schillhammer, H., S. Snäll, M. Coskun & N. Jansson, 2007. The West Palearctic species of *Hesperus* Fauvel, 1874, with description of three new species from Turkey (Coleoptera: Staphylinidae: Staphylininae). Koleopterologische Rundschau, 77: 123-132.

Sebek, P., J. Altman, M. Platek & L. Cizek, 2013. Is active management the key to the conservation of saproxylic biodiversity? Pollarding promotes the formation of tree hollows. PLoS One 8 (3): e60456.

Sirami, C., P. Jay-Robert, H. Brustel, L. Valladares, S. Le Guilloux & J. L. Martin, 2008. Saproxylic beetle assemblages of old Holm-oak trees in the Mediterranean region: role of a keystone structure in a changing heterogeneous landscape. Revue d'Ecologie, 10: 101-114.

Speight, M. C. D., 1989. Saproxylic intertebrates and their conservation. Council of Europe, Strasbourg, Nature and Environment Series, 42 pp.

Sunnergren, A., 2008. Tree Attributes of Foraging Middle Spotted Woodpeckers (*Dendrocopos medius*) and Nesting *Dendrocopos* spp. in Southern Turkey. (Master Thesis, Linköping University, Linköping, Sweden), 68 pp.

Tezcan, S., 2020. Analysis of the insect fauna of Turkey and suggestions for future studies. Munis Entomology & Zoology, 15 (2): 690-710.

Ulyshen, M. D., 2016. Wood decomposition as influenced by invertebrates. Biological Reviews, 91: 70-85.

Ulyshen, M. D. (Ed.), 2018. Saproxylic Insects-Diversity, Ecology and Conservation. Zoological Monographs 1, Springer, 904 pp.

Varlı, S. V., A. Tüven, H. Sürgüt, T. Öncül Abacıgil, N. Jansson & S. Tezcan, 2019. "Balıkesir İli Kapıdağ Yarımadası (Erdek) ve Kazdağında (Edremit körfezi) yaşlı çökük meşe ve kayın ağaçlarındaki saproksilik böcek faunası (Coleoptera), 149-150". 2. Uluslararası Bandırma ve Çevresi Sempozyumu, (17-19 Eylül, Bandırma), 365 pp.

Warren, M. S. & R. S. Key. 1989. "Woodlands: Past, Present, and Potential for Insects, 155-217". In: The Conservation of Insects and Their Habitats (Eds. N. M. Collins & J. A. Thomas). Academic Press, London, UK, 425 pp.

Yılmaz, H., 2018. "*Quercus* L. 338-356". Türkiye'nin Doğal-Egzotik Ağaç ve Çalıları (Ed. Ü. Akkemik). Orman Genel Müdürlüğü Yayınları, Ankara, 684 s (in Turkish).

Appendix

Table 1. Species and individual numbers by family

Family / Species name	Number of individuals	Presence rate (%)	IUCN Category Europa (Mediterranean)	Trophic category
ADERIDAE				
Aderus populneus (Creutzer in Panzer, 1796)	**9**	**0.07**		**SX**
ANOBIIDAE				
Anobiinae				
Falsogastrallus unistriatus (Zoufal, 1897)	**8**	**0.06**		**SX**
Oligomerus ptilinoides (Wollaston, 1854)	**2**	**0.02**		**SX**
Dorcatominae				
Caenocara anatolica Zahradník, 1998	**1**	**0.01**		**SX**
Dorcatoma sp.1	**1**	**0.01**		**SX**
Dorcatoma sp.2	**1**	**0.01**		**SX**
Stagetus sp.	**1**	**0.01**		**SX**
Stagetus byrrhoides (Mulsant & Rey, 1861)	**449**	**3.40**		**SX**
Stagetus elongatus (Mulsant & Rey, 1861)	**72**	**0.54**		**SX**
Stagetus franzi Español, 1969	**98**	**0.74**		**SX**
Eucradinae				
Ptinomorphus imperialis (L., 1767)	**6**	**0.05**		
Ptininae				
Dignomus fridsvaldszkyi (Reitter, 1884)	**28**	**0.21**		**SX**
Dignomus kroliki Borowski, 2002	**10**	**0.08**		**SX**
**Ptinus* (*Gynopterus*) *diversipennis* Pic, 1907	**10**	**0.08**		**SX**
**Ptinus (Ptinus) hirsutus* Pic, 1895	**1**	**0.01**		**SX**
**Ptinus (Ptinus) gylippus* Reitter, 1906	**1**	**0.01**		**SX**
/*Ptinus (Bruchoptinus) libanicus* Pic, 1899	**2**	**0.02**		**SX**
Ptinus (Ptinus) phlomidis Boieldieu, 1854	**2**	**0.02**		**SX**
**Ptinus (Cyphoderes) schlerethi* (Reitter, 1884)	**10**	**0.08**		**SX**
Ptinus (Bruchoptinus) torretassoi Pic, 1934	**5**	**0.04**		**SX**
Ptinus (Gynopterus) variegatus Rossi, 1792	**71**	**0.54**		**SX**
Xyletininae				
Lasioderma sp.	**1**	**0.01**		**UN**
Xyletinus sp.	**1**	**0.01**		
Xyletinus (Xyletinus) laticollis (Duftschmid, 1825)	**29**	**0.22**		
ANTHRIBIDAE				
Anthribinae				
**Anthribus nebulosus* Forster, 1770	**4**	**0.03**		**XY (SX,MY)**
Anthribus scapularis Gebler, 1833	**1**	**0.01**		**XY (SX,MY)**
**Noxius variegatus* (Fahraeus, 1839)	**1**	**0.01**		**XY (SX,MY)**
BIPHYLLIDAE				
**Diplocoelus fagi* Guérin-Méneville, 1838	**5**	**0.04**		**SX (MY,PR)**
BOSTRICHIDAE				
Bostrichinae				
Scobicia pustulata (Fabricius, 1801)	**1**	**0.01**	LC (LC)	**XY**
Sinoxylon muricatum (L., 1767)	**24**	**0.18**		**XY**
BOTHRIDERIDAE				
Teredinae				
**Oxylaemus cylindricus* (Panzer, 1796)	**8**	**0.06**		**PR**
BRENTHIDAE				
Amorphocephala coronata (Germar, 1817)	**53**	**0.40**		**MM**
BUPRESTIDAE				
Agrilinae				
Agrilus biguttatus (Fabricius, 1776)	**2**	**0.02**		**XY**
Agrilus cyanescens Ratzeburg, 1837	**5**	**0.04**		**XY**
Agrilus relegatus subsp. *alexeevi* Bellamy, 1998	**72**	**0.54**		**XY**
Coraebus sp.	**1**	**0.01**		**XY**
Coraebus rubi (L., 1767)	**1**	**0.01**		**XY**
Buprestinae				
Anthaxia (*Anthaxia*) *bicolor* Falderman, 1835	**22**	**0.17**		**XY**
Anthaxia (*Cratomerus*) *diadema* (Fischer, 1824)	**8**	**0.06**		**XY**
Anthaxia (*Anthaxia*) *discicollis* Gory & Laporte, 1839	**4**	**0.03**		**XY**
Anthaxia (*Cratomerus*) *eugeniae* Ganglbauer, 1885	**27**	**0.20**		**XY**
Anthaxia (*Anthaxia*) *herbertschmidi* Novak, 1992	**1**	**0.01**		**XY**
Anthaxia (*Anthaxia*) *midas* Kiesenwetter, 1857	**1**	**0.01**		**XY**
Anthaxia (*Haplanthaxia*) *millefolii* (Fabricius, 1801)	**1**	**0.01**		**XY**
Anthaxia (*Haplanthaxia*) *mundula* Kiesenwetter, 1857	**27**	**0.20**		**XY**
Anthaxia myrmidon Abeille de Perrin, 1891	**15**	**0.11**		**XY**
Anthaxia (*Melanthaxia*) *nigrojubata* Roubal, 1913	**76**	**0.58**		**XY**
Anthaxia (*Anthaxia*) *plicata* Kiesenwetter, 1859	**1**	**0.01**		**XY**
Anthaxia (*Haplanthaxia*) *praeclara* Mannerheim, 1837	**1**	**0.01**		**XY**
Sphenoptera (*Tropeopeltis*) *tappesi* Marseul, 1865	**1**	**0.01**		**XY**

Table 1. Continued

Family / Species name	Number of individuals	Presence rate (%)	IUCN Category Europa (Mediterranean)	Trophic category
Chrysobothrinae				
Chrysobothris (*Chrysobothris*) *affinis* (Fabricius, 1794)	**2**	**0.02**		**XY**
Polycestinae				
Acmaeodera (*Acmaeotethya*) *degener* (Scopoli, 1763)	**1**	**0.01**		**XY**
Acmaeodera (*Acmaeodera*) *flavolineata* Laporte & Gory, 1835	**1**	**0.01**		**XY**
Acmaeodera (*Acmaeotethya*) *ottomana* (Frivaldszki, 1837)	**3**	**0.02**		**XY**
Acmaeodera (*Acmaeotethya*) *saxicola* Spinola, 1838	**44**	**0.33**		**XY**
Acmaeoderella (*Omphalothorax*) *longissima* (Abeille de Perrin, 1904)	**1**	**0.01**		**XY**
CERAMBYCIDAE				
Cerambycinae				
Axinopalpis gracilis (Krynicky, 1832)	**37**	**0.28**	LC	**XY**
Callimus angulatus (Schrank, 1789)	**1**	**0.01**	LC	**XY**
Cerambyx cerdo L., 1758	**16**	**0.12**	NT (LC)	**XY**
Chlorophorus nivipictus Halperin & Holzschuh, 1993	**3**	**0.02**	LC (LC)	**XY**
Delagrangeus (Delagrangeus) angustissimus Pic, 1892	**3**	**0.02**		
Phymatodes testaceus (L., 1758)	**5**	**0.04**	LC	**XY**
Phymatodes (Poecilium) wrzecionkoi (Rapuzzi et G. Sama, 2010)	**5**	**0.04**	LC	**XY**
Stenhomalus (Obriopsis) bicolor (Kraatz, 1852)	**2**	**0.02**	LC (LC)	**XY**
Stromatium unicolor (Olivier, 1795)	**2**	**0.02**	LC (LC)	**XY**
Trichoferus griseus (Fabricius, 1792)	**2**	**0.02**	LC (LC)	**XY**
Lepturinae				
Cortodera imrasanica Sama & Rapuzzi, 1999	**12**	**0.09**		**XY**
Grammoptera merkli Frivaldszky, 1884	**1**	**0.01**		**XY**
Rhagium syriacum Pic, 1892	**6**	**0.05**		**XY**
Spondylidinae				
Alocerus moesiacus (Frivaldsky, 1838)	**77**	**0.58**		
CERYLONIDAE				
Ceryloninae				
**Cerylon histeroides* (Fabricius, 1792)	**1**	**0.01**		**MY**
CETONIIDAE				
Cetoniinae				
Chromovalgus peyroni (Mulsant, 1852)	**1**	**0.01**	**(VU)**	**SX**
Protaetia (Netocia) angustata (Germar, 1817)	**18**	**0.14**	LC	**SX**
Protaetia (Eupotosia) mirifica (Mulsant, 1842)	**8**	**0.06**	VU (VU)	**SX**
Protaetia (Cetonischema) speciosa (Adams, 1817)	**14**	**0.11**		**SX**
Tropinota (Epicometis) hirta (Poda, 1761)	**32**	**0.24**		**UN**
CIIDAE				
Cis tauriensis Krolik, 2002	**7**	**0.05**		**MB**
Xylographus bostrichoides (Dufour, 1843)	**4**	**0.03**		**MB**
CLERIDAE				
Clerinae				
Clerus mutillarius Fabricius, 1775	**2**	**0.02**		**PR**
Opilo taeniatus (Klug, 1842)	**27**	**0.20**	**(DD)**	**PR**
Trichodes punctatus Fischer von Waldheim, 1829	**2**	**0.02**		
Korynetinae				
Korynetes caeruleus (De Geer, 1775)	**13**	**0.10**		**PR**
Korynetes coxalis Reitter, 1894	**2**	**0.02**	**(DD)**	**PR**
Tillinae				
Tilloidea unifasciata (Fabricius, 1787)	**1**	**0.01**		**PR**
CORYLOPHIDAE				
Corylophinae				
Clypastraea sp.	**1**	**0.01**		**MY**
CRYPTOPHAGIDAE				
Atomariinae				
**Atomaria (Atomaria) slavonica* Johnson, 1971	**8**	**0.06**		**MY**
Cryptophaginae				
Cryptophagus cylindrellus Johnson, 2007	**1**	**0.01**		**MB**
Cryptophagus jakowlewi Reitter, 1888	**18**	**0.14**		**MY**
Cryptophagus punctipennis C.N.F. Brisout de Barneville, 1863	**39**	**0.30**		**SP**
**Cryptophagus quercinus* Kraatz, 1852	**1**	**0.01**		**MY (MM)**
Cryptophagus uncinatus Stephens, 1830	**114**	**0.86**		**NI**
CUCUJIDAE				
Cryptolestes sp.	**3**	**0.02**		
CURCULIONIDAE				
Cossoninae				
Rhyncolus (Rhyncolus) ater (L., 1758)	**4**	**0.03**		**SX**
Cryptorhynchinae				
Camptorhinus statua (Rossi, 1790)	**10**	**0.08**		**SX**

Table 1. Continued

Family / Species name	Number of individuals	Presence rate (%)	IUCN Category Europa (Mediterranean)	Trophic category
Mesoptilinae				
Magdalis (Laemosaccidius) exarata (H. Brisout de Barneville, 1862)	**1**	**0.01**		**XY**
Magdalis (Magdalis) frontalis (Gyllenhal, 1827)	**11**	**0.08**		**XY**
Platypodinae				
Platypus simulans (Schedl, 1941)	**4**	**0.03**		
Scolytinae				
Carphoborus perrisi (Chapuis, 1869)	**8**	**0.06**		**XY**
Hylesinus crenatus (Fabricius, 1787)	**1**	**0.01**		**XY**
Hylesinus varius (Fabricius, 1775)	**9**	**0.07**		**XY**
Hypothenemus eruditus Westwood, 1836	**1**	**0.01**		**XY**
Scolytus rugulosus (Muller, 1818)	**37**	**0.28**		**XY**
Taphrorychus hirtellus (Eichhoff 1879)	**1**	**0.01**		**XY**
Taphrorychus ramicola (Reitter, 1894)	**206**	**1.56**		**XY**
Xyleborus monographus (Fabricius, 1792)	**129**	**0.98**		**MY**
Xyleborus dryographus (Ratzeburg, 1837)	**1109**	**8.39**		**MY**
DERMESTIDAE				
Attageninae				
Attagenus brunnescens Pic, 1904	**4**	**0.03**		**NI**
Attagenus quadrimaculatus Kraatz, 1858	**305**	**2.31**		**NI**
Attagenus pantherinus (Ahrens, 1814)	**3**	**0.02**		**NI**
Attagenus unicolor (Brahm, 1791)	**33**	**0.25**		**NI**
Dermestinae				
Dermestes (Dermestinus) undulatus Brahm, 1790	**32**	**0.24**		**NI**
Megatominae				
Anthrenus (Anthrenus) delicatus Kiesenwetter, 1851	**383**	**2.90**		**NI**
Anthrenus (Anthrenus) scrophulariae (L., 1758)	**70**	**0.53**		**NI**
Anthrenus (Florilinus) sordidulus Reitter, 1889	**7**	**0.05**		**NI**
Anthrenus (Florilinus) verbasci (L., 1767)	**21**	**0.16**		**NI**
Ctesias maculifasciata (Reitter, 1899)	**990**	**7.49**		**SX**
Globicornis (Globicornis) kafkai Háva, 2000	**27**	**0.20**		**SX**
Globicornis (Globicornis) picta (Kuester, 1851)	**437**	**3.31**		**SX**
Phradonoma (Phradonoma) nobile (Reitter, 1881)	**1**	**0.01**		**NI**
Trogoderma glabrum (Herbst, 1783)	**26**	**0.20**		**SX**
Orphilinae				
Orphilus niger (Rossi, 1790)	**15**	**0.11**		**SX**
DASYTIDAE				
Danaceinae				
Danacea (Danacea) marginata (Kuster, 1850)	**13**	**0.10**		**UN**
Danacea (Danacea) olivacea Baudi, 1873	**269**	**2.04**		**UN**
Rhadalinae				
Aplocnemus sp.	**808**	**6.11**		**PR**
Aplocnemus (Aplocnemus) rufipes Miller, 1862	**1**	**0.01**		**PR**
ELATERIDAE				
Agrypninae				
Lacon ladae (Mertlik & Dusanek, 2006)	**1**	**0.01**	**(LC)**	**PR**
Ampedini				
Nothodes parvulus (Panzer, 1799)	**28**	**0.21**		
Peripontius terminatus (Erichson, 1841)	**75**	**0.57**		
Reitterelater dubius Platia & Cate, 1990	**1**	**0.01**	**DD**	**PR**
Cardiophorinae				
Cardiophorus analis (Schwarz, 1892)	**1**	**0.01**		**PR**
Cardiophorus (Cardiophorus) anticus Erichson, 1840	**17**	**0.13**	**(LC)**	**PR**
Cardiophorus (Cardiophorus) discicollis (Herbst, 1806)	**14**	**0.11**		**PR**
Cardiophorus kindermanni Candeze, 1860	**50**	**0.38**	**(LC)**	**PR**
Cardiophorus (Cardiophorus) parvulus Platia & Gudenzi, 2000	**1109**	**8.39**		**PR**
Dicronychus merkli (Pic, 1910)	**166**	**1.26**		
Dendrometrinae				
Elathous nurayae Platia, 2011	**9**	**0.07**		
Elaterinae				
Melanotus (Melanotus) fusciceps (Gyllenhal, 1817)	**394**	**2.98**	**LC**	**PR**
Mulsanteus guillebeaui (Mulsant & Godart, 1853)	**458**	**3.47**		**PR**
Megapenthes lugens (L. Redtenbacher, 1842)	**1**	**0.01**	**NT**	**PR**
Lissominae				
Drapetes mordelloides (Host, 1789)	**1**	**0.01**		**UN**
ENDOMYCIDAE				
Anamorphinae				
**Symbiotes gibberosus* (Lucas, 1846)	**12**	**0.09**		**MB**
Holoparamecinae				
**Holoparamecus (Calyptobium) caularum* Aube, 1843	**1**	**0.01**		

Table 1. Continued

Family / Species name	Number of individuals	Presence rate (%)	IUCN Category Europa (Mediterranean)	Trophic category
EROTYLIDAE				
Tritominae				
Triplax russica (L., 1758)	**219**	**1.66**	**LC**	**MB**
EUCHIRIDAE				
Euchirinae				
Propomacrus bimucronatus (Pallas, 1781)	**374**	**2.83**	VU (VU)	**SX**
EUCNEMIDAE				
Melasinae				
**Clypeorhagus clypeatus* (Hampe, 1850)	**143**	**1.08**		**SX**
Farsus dubius (Piller & Mitterbacher, 1783)	**11**	**0.08**	(NT)	**SX**
Isoriphis melasoides (Laporte de Castelnau, 1835)	**1**	**0.01**	LC	**SX**
HISTERIDAE				
Abraeinae				
Pleuroleptus rothi (Rosenhauer, 1856)	**45**	**0.34**		**PR**
Dendrophilinae				
Cyclobacanius soliman (Marseul, 1862)	**1**	**0.01**		**PR**
Dendrophilus (Dendrophilus) punctatus (Herbst, 1792)	**14**	**0.11**		**PR**
Platylomalus gardineri (Scott, 1913)	**2**	**0.02**		**PR**
Paromalus (Paromalus) filum Reitter, 1884	**2**	**0.02**		**PR**
Histerinae				
Atholus corvinus (Germar, 1817)	**2**	**0.02**		**PR**
Cylister cornix (Marseul, 1861)	**1**	**0.01**		**PR**
Merohister ariasi (Marseul, 1864)	**24**	**0.18**		**PR**
Platysoma (Platysoma) compressum (Herbst, 1783)	**35**	**0.26**		**PR**
**Platysoma (Platysoma) deplanatum* (Gyllenhal, 1808)	**3**	**0.02**		**PR**
Platysoma (Platysoma) inexpectatum Lackner, 2004	**3**	**0.02**		**PR**
Saprininae				
**Gnathoncus buyssoni* Auzat, 1917	**2**	**0.02**		**PR**
Gnathoncus rotundatus (Kugelann, 1792)	**1**	**0.01**		**PR (NI)**
Tribalinae				
Epierus comptus Erichson, 1834	**4**	**0.03**		**PR**
LAEMOPHLOEIDAE				
Laemophloeinae				
**Cryptolestes* sp.	**4**	**0.03**		**MY**
Laemophloeus monilis (Fabricius, 1787)	**2**	**0.02**		**MY**
**Placonotus testaceus* (Fabricius, 1787)	**1**	**0.01**		**SX**
LATRIDIIDAE				
Corticariinae				
Corticaria elongata (Gyllenhal, 1827)	**7**	**0.05**		**MY**
Latridiinae				
Enicmus rugosus (Herbst, 1793)	**16**	**0.12**		**MY**
LUCANIDAE				
Lucaninae				
Dorcus parallelipipedus (L., 1785)	**4**	**0.03**	LC	**SX**
MALACHIIDAE				
Malachiinae				
**Acromalachius clavicornis* (Peyron, 1877)	**1**	**0.01**		**PR**
**Anthocomus semipolitus* Abeille de Perrin, 1882	**36**	**0.27**		**PR**
**Cephaloncus albozonatus* (Abeille de Perrin, 1883)	**8**	**0.06**		**PR**
**Cephaloncus rhinoceros* Marseul, 1868	**6**	**0.05**		**PR**
**Charopus thoracicus* Morawitz, 1861	**2**	**0.02**		**PR**
Ebaeus sp.	**1**	**0.01**		**PR**
Hypebaeus senaci (Abeille, 1890)	**17**	**0.13**		**PR**
Malachius fucatus Peyron, 1877	**119**	**0.90**		**PR**
**Nepachys amaenus* Peyron, 1877	**1**	**0.01**		**PR**
**Sphinginus coarctatus* (Erichson, 1840)	**4**	**0.03**		**PR**
MELANDRYIDAE				
Melandryinae				
Abdera (Abdera) quadrifasciata (Curtis, 1829)	**2**	**0.02**		**MY**
Orchesia (Orchesia) micans (Panzer, 1794)	**239**	**1.81**		**MY**
**Phloiotrya (Phloiotrya) rufipes* (Gyllenhal, 1810)	**1**	**0.01**		**MY**

Table 1. Continued

Family / Species name	Number of individuals	Presence rate (%)	IUCN Category Europa (Mediterranean)	Trophic category
MORDELLIDAE				
Mordellinae				
Mediimorda attalica Schilsky, 1895	**3**	**0.02**		
Mordellistena sp.1 (episternalis-group)	**25**	**0.19**		**SX**
Mordellistena sp.2 (pumila-group)	**2**	**0.02**		**SX**
Mordellistena sp.3 (pumila-group)	**1**	**0.01**		**SX**
Mordellistena sp. 4	**10**	**0.08**		**SX**
Mordellistena episternalis- group bis	**1**	**0.01**		**SX**
**Mordellistena (Mordellistena) neuwaldeggiana* (Panzer, 1796)	**155**	**1.17**		**SX**
cf. Mordellochroa humerosa bis	**27**	**0.20**		**SX**
MYCETOPHAGIDAE				
Mycetophaginae				
Mycetophagus (Mycetophagus) quadripustulatus (L., 1761)	**14**	**0.11**	LC	**MY**
NITIDULIDAE				
Carpophilinae				
Carpophilus bipustulatus (Heer, 1841)	**142**	**1.07**		**SF**
Cryptarchinae				
Cryptarcha bifasciata Baudi, 1870	**79**	**0.60**		**MY**
Epuraeinae				
Epuraea pallescens (Stephens, 1835)	**47**	**0.36**		**MY**
Nitidulinae				
Soronia oblonga C. Brisout de Barneville, 1863	**5**	**0.04**		**SF**
OEDEMERIDAE				
Oedemerinae				
Ischnomera auripennis (Reitter, 1903)	**1**	**0.01**		**SX**
Ischnomera caerulea (L., 1758)	**5**	**0.04**		**SX**
Ischnomera haemorrhoidalis (W. Schmidt, 1846)	**6**	**0.05**		**SX**
Ischnomera fuscipennis Švihla, 1988	**10**	**0.08**		**SX**
Oedemera (Oncomera) flavicans (Fairmaire, 1860)	**34**	**0.26**		**SX**
RIPIPHORIDAE				
Clinops spectabilis Schaufuss, 1872	**1**	**0.01**		
SCIRTIDAE				
Prionocyphon ornatus Abeille de Perrin, 1881	**27**	**0.20**		**SP**
**Sacodes flavicollis* (Kiesenwetter, 1859)	**3**	**0.02**		**UN**
SCRAPTIIDAE				
Anaspidinae				
Anaspis (Anaspis) sp.1	**208**	**1.57**		**SX**
Anaspis (Larisa) sp.2	**329**	**2.49**		**SX**
Anaspis (Larisa) sp.3	**30**	**0.23**		**SX**
Anaspis (Nassipa) melanostoma Costa, 1854	**22**	**0.17**		**SX**
Scraptiinae				
Scraptia sp.	**215**	**1.63**		**SX**
SPHINDIDAE				
Aspidiphorinae				
**Aspidiphorus orbiculatus* (Gyllenhal, 1808)	**6**	**0.05**		**MY**
STAPHYLINIDAE				
Aleocharinae				
Aleochara brevipennis Gravenhorst, 1806	**5**	**0.04**		**PR**
Aleochara intricata Mannerheim, 1830	**2**	**0.02**		**PR**
Gyrophaena sp.	**32**	**0.24**		
Haploglossa villosula (Stephens, 1832)	**63**	**0.48**		**PR**
Myllaena intermedia Erichson, 1837	**1**	**0.01**		**PR**
Oxytelinae				
Platystethus nitens (C. R. Sahlberg, 1832)	**6**	**0.05**		
Staphylininae				
Gyrohypnus angustatus Stephens, 1833	**1**	**0.01**		**PR**
Hypnogyra angularis (Ganglbauer, 1895)	**1**	**0.01**		**PR**
Scaphidiinae				
**Scaphisoma agaricinum* (L., 1758)	**1**	**0.01**		**MY**
**Scaphisoma subalpinum* Reitter, 1881	**6**	**0.05**		**MY**
Tachyporinae				
Tachyporus nitidulus (Fabricius, 1781)	**2**	**0.02**		**PR**

Table 1. Continued

Family / Species name	Number of individuals	Presence rate (%)	IUCN Category Europa (Mediterranean)	Trophic category
TENEBRIONIDAE				
Alleculinae				
Allecula oronthea Baudi di Selve, 1881	**102**	**0.77**		**SX**
Hymenalia atronitens Fairmaire, 1892	**644**	**4.87**		**SX**
Hymenalia graeca Seidlitz, 1896	**4**	**0.03**		**SX**
Mycetochara sp.1	**1**	**0.01**		**SX**
Mycetochara quadrimaculata (Latreille, 1804)	**408**	**3.09**		**SX**
Mycetocharina rufotestacea Reitter, 1898	**20**	**0.15**		**SX**
Prionychus cisteloides Seidlitz, 1896	**19**	**0.14**		**SX**
Prionychus nitidissimus Pic, 1905	**2**	**0.02**		**SX**
Pseudocistela ceramboides (L., 1761)	**1**	**0.01**		**SX**
Diaperinae				
*Alphitophagus bifasciatus (*Say, 1824)	**2**	**0.02**		**MY**
Corticeus turcicus Soldati, 2019	**6**	**0.05**		**CO (MY, PR)**
*Pentaphyllus testaceus (*Hellwig, 1792)	**1**	**0.01**		**MB**
Lagriinae				
Lagria atripes Mulsant & Guillebeau, 1855	**1**	**0.01**		
Palorinae				
*Palorus ratzeburgi (*Wissmann, 1848)	**22**	**0.17**		**SX**
Tenebrioninae				
*Lyphia tetraphylla (*Fairmaire, 1856)	**4**	**0.03**		**CO (MY)**
*Metaclisa azurea (*Waltl, 1838)	**8**	**0.06**		**SX**
Odocnemis evestigata Nabozhenko & Keskin, 2016	**8**	**0.06**		**SX**
Tenebrio obscurus Fabricius, 1792	**9**	**0.07**		**SX**
TETRATOMIDAE				
Eustrophus dermestoides (Hellwig, 1792)	**13**	**0.10**		**MY**
TROGIDAE				
Troginae				
Trox (Trox) scaber (L., 1767)	**1**	**0.01**		**NI**
TROGOSITIDAE				
Trogositinae				
Nemozoma elongatum (L., 1761)	**1**	**0.01**	LC	**PR**
Temnochila caerulea (Olivier, 1790)	**7**	**0.05**	LC (LC)	**PR**
ZOPHERIDAE				
Colydiinae				
Colobicus hirtus (Rossi, 1790)	**10**	**0.08**		**SX**
Colydium elongatum (Fabricius, 1787)	**3**	**0.02**		**PR**
TOTAL	**13,217**	**100**		

*New records for Türkiye