

Bostrichoidea Species in Forest Nurseries of the Western Black Sea Region of Türkiye*

Türkiye'nin Batı Karadeniz Bölgesi Orman Fidanlıklarındaki Bostrichoidea Türleri

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Abstract

The study was conducted using light traps and pheromone traps between 2021 and 2022 in selected forest nurseries of the Western Black Sea Region of Türkiye. The insect species were morphologically described. Identification of species was made by referring to the relevant literature. The antenna and aedeagus of some species were photographed using a stereo microscope. In total, 3 families, 7 subfamilies, 7 genera and 6 species were identified in this study. These species are *Anobium punctatum*, *Attagenus persicus*, *Dermestes undulatus*, *Ptinus (Bruchoptinus)* sp., *Sinoxylon sexdentatum*, *Trogoderma inclusum*, and *Xestobium rufovillosum*. At the end of the study, 2 insect species were identified as new records for the region.

Keywords: Bostrichoidea, Coleoptera, Forest nursery, Türkiye

Özet

Bu çalışma, 2021-2022 yılları arasında ışık tuzağı ve feromon tuzağı kullanılarak Türkiye'nin Batı Karadeniz Bölgesi'nin seçilmiş orman fidanlıklarında yapılmıştır. Böcek türleri morfolojik olarak tanımlanmıştır. Tür tanımlamaları ilgili literatüre başvurularak yapılmıştır. Bazı türlerin anten ve aedeagusu stereo mikroskop kullanılarak fotoğraflanmıştır. Bu çalışmada toplam 3 familya, 7 alt familya, 7 cins ve 6 tür tespit edilmiştir. Bunlar, *Anobium punctatum*, *Attagenus persicus*, *Dermestes undulatus*, *Ptinus (Bruchoptinus)* sp., *Sinoxylon sexdentatum*, *Trogoderma inclusum*, ve *Xestobium rufovillosum*'dur. Çalışma sonunda 2 böcek türü bölge için yeni kayıt olmuştur.

Anahtar Kelimeler: Bostrichoidea, Coleoptera, Orman fidanlığı, Türkiye

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1. Introduction

The superfamily Bostrichoidea Latreille, 1802 are well adapted for dry habitats and feed on wood, stored grains, cereal products, dry plant or animal material, tobacco, museum specimens, pollen and nectar (Lawrence and Britton, 1991; Háva, 2015a; Elgharbawy and Abied, 2019). The bostrichid beetles are distributed worldwide (Liu, 2010), and mainly found in the tropics and temperate countries (Seada and Hamza, 2023). Species of this superfamily are pests of forestry crops and agricultural products (Price et al., 2011; Park et al., 2015; Elgharbawy and Abied, 2019; Biggs et al., 2022). The larvae of some species damage cereal products, seeds, and structural wood of buildings (Elgharbawy and Abied, 2019; Biggs et al., 2022).

The family Bostrichidae Latreille, 1802 is a small group and plays a significant role in the forestry and forest products industry sector (Liu, 2010; Legalov and Háva, 2022; Holloway and Sparks, 2023). Both adults and larvae of the Bostrichidae species infest dry and dead wood (Sittichaya et al., 2013).

Dermestid beetles (Coleoptera: Dermestidae) belonging to the superfamily Bostrichoidea are found throughout the world and are common pests of stored food products (Beal, 1961; Peacock, 1993; Biggs et al., 2022). The larvae feed on animal and vegetable material, wool rugs, clothing, animal skins and dead insects (Peacock, 1993).

The family Ptinidae Latreille, 1802, another member of the Bostrichoidea, is a cosmopolitan group and known as spider beetles (Belles and Mifsud, 2000; Philips, 2000). This family includes about 2.800 species worldwide (Elgharbawy and Abied, 2019).

Several studies have been conducted to investigate the insect species in forests and nurseries around the world and in Türkiye. Although, very few studies have been conducted about the bostrichid beetles of forest nurseries in the Western Black Sea Region. The aim of this study is to contribute to knowledge about the Bostrichoidea fauna in selected forest nurseries of Türkiye.

2. Material and Method

The main purpose of this study is to investigate the insect species in seven forest nurseries in five provinces in the Western Black Sea Region of Türkiye (Figure 1). The below mentioned materials were obtained in six forest nurseries in four provinces (Düzce (Pınar Forest Nursery (F.N.)) (40°48'54.72"N 31°13'58.70"E); Bolu (Bolu F.N) (40°42'10.12"N 31°34'58.38"E); Kastamonu (Daday F.N.) (41°28'37.70"N 33°31'10.44"E);

Kastamonu (Gölköy F.N.) (41°27'0.44"N 33°45'53.64"E); Kastamonu (Muzaffer Büyükerzi F.N.) (41°24'17.58"N 34°22'29.03"E); Zonguldak (Gökçebey F.N.) (41°18'51.31"N 32°5'36.10"E)). For this purpose, three pheromone traps and one light trap were established for each forest nursery from April to September during 2021 and 2022. These traps were inspected monthly and insect samples were collected with light traps and pheromones (ipfenol and 2-methyl-3-buten-2-ol and α -pinene) from June to August. The materials were placed in plastic collecting jars and sent to the laboratory. The morphology of the insect samples was examined using a stereo microscope (Olympus SZ51). The aedeagus specimens were dissected from the abdomen under a stereo microscope and heated in KOH solution (10%) until soft. Then, the aedeagi were passed through a series of ascending alcohol concentrations (75%, 80%, 85%, 90%, and 100%) for 10 min each for dehydration and photographed with Nikon SMZ 745T microscope and Nikon DS-Fi1 camera (Figure 2,3).

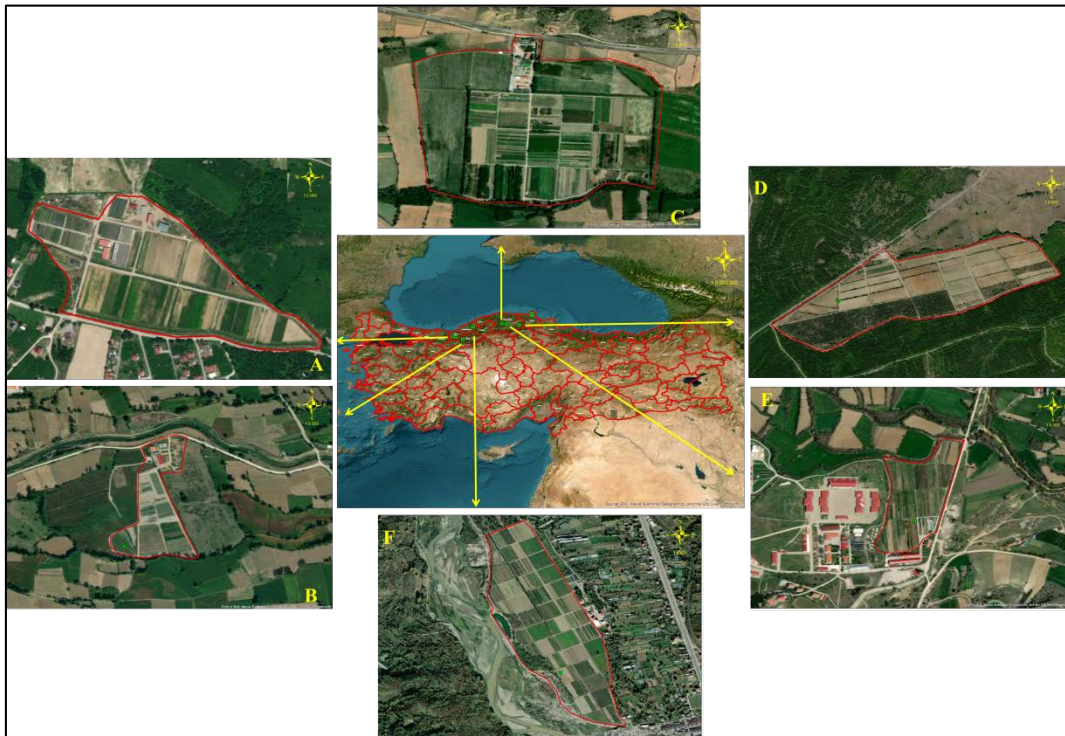


Figure 1. Location of forest nurseries: A) Pınar F.N., B) Bolu F.N., C) Daday F.N., D) Muzaffer Büyükerzi F.N., E) Gölköy F.N., F) Gökçebey F.N.

The identification and classification of Bostrichoidea species were made based on the relevant literature (Freude et al., 1969; Özdemir and Sert, 2008; Mosneagu, 2012; EPPO, 2013; Anonymous, 2023; Elgharbawy and Abied, 2019). An insect specimen belonging to the genus *Attagenus* Latreille, 1802 was identified by Andreas Herrmann from Germany and by Graham J. Holloway from the Cole Museum of Zoology in the University of Reading. Also, the genus *Trogoderma* Dejean, 1821 was identified by Jiří Háva from the Czech

Republic. The *Ptinus* Linnaeus, 1766 species was identified by Keith Philips from Western Kentucky University and Petr Zahradník from Czech Republic.

3. Results

In total, 6 species in 3 families of the superfamily Bostrichoidea were collected and identified in four provinces (Table 1). The information on the beetles found in this study is given alphabetically as follows.

Table 1. Species of superfamily Bostrichoidea collected from forest nurseries.

Species	Study Area*						Total	%
	B	D	T	GK	GL	DZ		
Family: Bostrichidae Tribe: Sinoxylini								
<i>Sinoxylon sexdentatum</i>				1			1	2.78
Family: Dermestidae Tribe: Anthrenini								
<i>Trogoderma inclusum</i>	4	1		1	2	17	25	69.44
Tribe: Attagenini								
<i>Attagenus persicus</i>					2		2	5.56
Tribe: Dermestini								
<i>Dermestes undulatus</i>	1	1				3	5	13.89
Family: Ptinidae Tribe: Anobiini								
<i>Anobium punctatum</i>				1			1	2.78
Tribe: Ptinini								
<i>Ptinus (Bruchoptinus) sp.</i>			1				1	2.78
Tribe: Xestobiini								
<i>Xestobium rufovillosum</i>					1		1	2.78
Numbers of individuals	5	2	1	3	5	20	36	

Species	Study Area*						Total	%
	B	D	T	GK	GL	DZ		
Numbers of species	2	2	1	3	3	2		

* Abbreviation; B: BOLU FOREST NURSERY (F.N.), D: DADAY F.N. (KASTAMONU), T: MUZAFFER BÜYÜK TERZİ F.N. (TAŞKÖPRÜ-KASTAMONU), GK: GÖKÇEBEY F.N. (ZONGULDAK), GL: GÖLKÖY F.N. (KASTAMONU), DZ: PINAR F.N. (DÜZCE).

Family **BOSTRICHIDAE** Latreille, 1802

Subfamily Bostrichinae Latreille, 1802

Tribe Sinoxylini Liu & Schönitzer, 2011

Genus *Sinoxylon* Duftschmid, 1825

Sinoxylon sexdentatum (Olivier, 1790)

Material examined: Gökçebey F.N., June, 2022, 1 specimen with light trap.

Distribution in Türkiye: Adıyaman, Aydın, Batman, Bursa, Gaziantep, Mardin, Siirt, Şanlıurfa (Çelik, 1975; Akşit et al., 2005; Gençer et al., 2005; Bolu, 2016).

General Distribution: Albania, Algeria, Austria, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Canary Islands, China, Croatia, Cyprus, Egypt, France, Germany, Greece, Hungary, Israel, Iran, Italy, Libya, Morocco, Portugal, Russia, Sardinia, Sicily, Spain, Syria, Tunisia, Ukraine (Borowski and Wegrzynowicz, 2007; Liu et al. 2016; Liu, 2021).

Family **DERMESTIDAE** Latreille, 1804

Subfamily Attageninae Casey, 1900

Tribe Attagenini Castelnau, 1840

Genus *Attagenus* Latreille, 1802

Attagenus persicus (Reitter, 1881)

Material examined: Gökçöy F.N., August, 2021, 2 specimens with light trap.

Distribution in Türkiye: Adana, Antalya, Çanakkale, Çankırı, Erzincan, Mersin, Nevşehir (Tezcan and Háva, 2022).

General Distribution: Greece, Iran, Syria (Háva, 2015b).

Subfamily Dermestinae Latreille, 1804

Tribe Dermestini Latreille, 1804

Genus *Dermestes* Linnaeus, 1758

***Dermestes undulatus* (Brahm, 1790)**

Material examined: Bolu F.N., June, 2022, 1 specimen with pheromone trap, Daday F.N., August, 2021, 1 specimen with pheromone trap, Pınar F.N., July, 2021, 3 specimens with pheromone trap. Total of 5 specimens.

Distribution in Türkiye: Ankara, Adıyaman, Balıkesir, Bursa, Çanakkale, Elazığ, Eskişehir, Istanbul, Izmir, Kastamonu, Mersin, Samsun (Karapazarlıoğlu, 2004; Kadej and Háva, 2007; Özdemir, 2007; Yuca, 2009; Ibiş, 2015; Altunsoy et al., 2017; Özgen and Háva, 2018; Erdoğan, 2019; Sürgüt, 2022).

General Distribution: Albania, Algeria, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canary Islands, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, Italy, Kazakhstan, Latvia, Libya, Lithuania, Macedonia, Morocco, The Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia (Háva, 2007).

Subfamily Megatominae Leach, 1815

Tribe Anthrenini Gistel 1848

Genus *Trogoderma* Dejean, 1821

***Trogoderma inclusum* (LeConte, 1854)**

Material examined: Bolu F.N., June, 2021, 2 specimens with light trap, June, 2022, 2 specimens with pheromone trap, Daday F.N., August, 2021, 1 specimen with pheromone trap, Gökçebey F.N., August, 2021, 1 specimen with pheromone trap, Gölköy F.N., August, 2021, 2 specimens with pheromone trap, Pınar F.N., June, 2021, 10 specimens with pheromone trap, July, 2021, 7 specimens with pheromone trap. Total of 25 specimens.

Distribution in Türkiye: There is no detailed information available about the distribution area (Tezcan et al., 2004).

General Distribution: Algeria, Canada, Canary Island, Croatia, Egypt, France, Great Britain, Greece, Hungary, India, Iran, Iraq, Israel, Italy, Japan, Maltese Islands, Morocco, Russia, Spain, Serbia and Montenegro, The Netherlands, Tunisia, USA (Háva and Mifsud, 2006; Löbl and Smetana, 2007).

Family **PTINIDAE** Latreille, 1802

Subfamily Anobiinae Fleming, 1821

Tribe Anobiini Fleming, 1821

Genus *Anobium* Fabricius, 1775

***Anobium punctatum* (De Geer, 1774)**

Material examined: Gökçebey F.N., July, 2021, 1 specimen with light trap.

Distribution in Türkiye: Ankara, Ardahan, Bartın, Göynük, Gümüşhane, İstanbul, Karadeniz Ereğli, Kastamonu, Mudurnu, Rize, Sinop (Çanakçıoğlu and Mol, 1998; Kaygın et al., 2008).

General Distribution: Asia, Australia, Egypt, New Zealand, North Africa, Romania, South Africa, The Eastern Seaboard of North America, The United Kingdom (Child and Pinniger, 2014).

Subfamily Ptininae Latreille, 1803

Tribe Ptinini Latreille 1802

Genus *Ptinus* Linnaeus, 1766

***Ptinus (Bruchoptinus)* sp.**

Material examined: Muzaffer Büyükterzi F.N., July, 2022, 1 specimen with pheromone trap.

Distribution in Türkiye: There is no detailed information available about the distribution.

General Distribution: Cyprus, Greece, Lebanon, Syria (Löbl and Smetana, 2007).

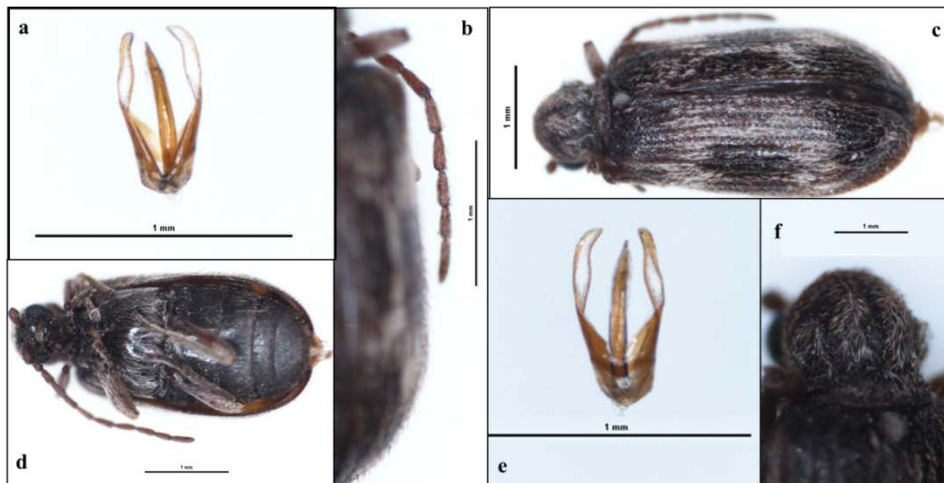


Figure 2. *Ptinus (Bruchoptinus)* sp. ♂: male genitalia (a,e); antenna (b); dorsal view (c); ventral view (d); pronotum (f).

Subfamily Ernobiinae Pic, 1912

Tribe Xestobiini Böving 1927

Genus *Xestobium* Motschulsky, 1845

Xestobium rufovillosum (De Geer, 1774)

Material examined: Gököy F.N., August, 2021, 1 specimen with pheromone trap.

Distribution in Türkiye: Balıkesir, Düzce, Kastamonu, Istanbul, (Çanakçıoğlu and Mol, 1998; Akçay and Yalçın, 2019; Sürgüt, 2022).

General Distribution: Armenia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czechia, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, The Netherlands, Moldova, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Sweden, Switzerland, Turkmenistan, Ukraine (Löbl and Smetana, 2007; Zahradnik, 2016).

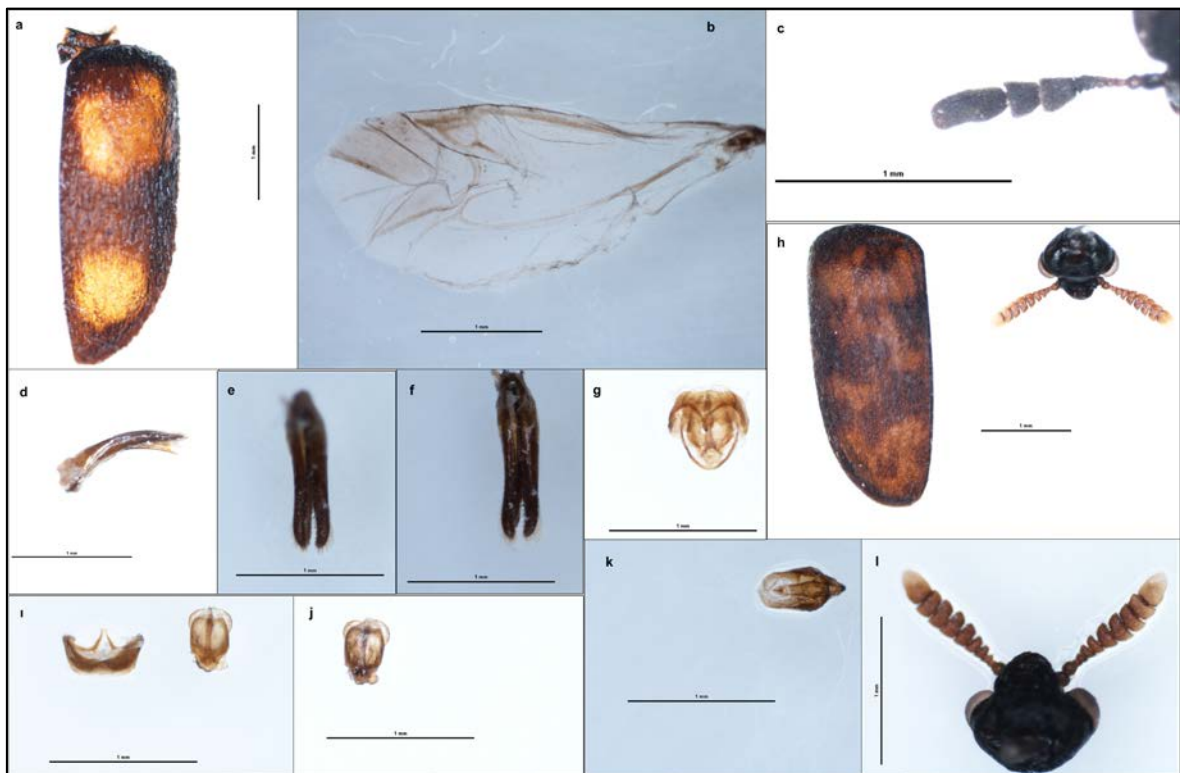


Figure 3. *Attagenus persicus* ♂: elytral pattern (a), hind wing (b), antenna (c), male genitalia (k); *Dermestes undulatus* ♂: male genitalia (d-f); *Trogoderma inclusum* ♂: male genitalia (g, i, j); *Trogoderma inclusum* ♂: elytral pattern and antenna (h), antenna (l).

4. Discussion

In total, 36 individuals were collected representing 7 tribes, 7 genera, and 7 species from June to August during 2021 and 2022. The most abundant tribe was Anthrenini (69.44% - 1 species), followed by Dermestini (13.89% - 1 species) (Table 1).

In 2021, a total of 31 specimens were collected. The greatest insect abundance was recorded in June (38.7%). In 2022, a total of 5 specimens were captured and the greatest quantities were obtained in June.

Among these species, *A. persicus*, and *S. sexdentatum* and were new records for the insect fauna of the Western Black Sea Region.

Forest nurseries have strategic importance in the development and sustainability of forests (Alkan & Divrik, 2019). The use of high quality seedlings in afforestation activities carried out for this purpose greatly influences success (Riikonen & Luoranen, 2018; Gregorio et al., 2020). A high quality seedling production depends on good cultivation techniques (Kahraman, 1993). On the other hand, insects are one of the significant factors affecting seedling quality and development in nurseries (Grossnickle & MacDonald, 2018; Haase et al., 2021). Insect pests interrupt the success of these afforestation activities by damaging parts of plants such as leaves, stems, roots, seeds, fruits and cones (Yager et al., 2018). Therefore; monitoring, evaluation, and determination of the insect species in nurseries are important to detection of problems early.

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