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Faunistic Observations On Scolytinae (Coleoptera: Curculionidae) In Afyonkarahisar Region Of Turkey

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ABSTRACT : *Scolytinae (Coleoptera: Curculionidae) species and their host plants in forests of Afyonkarahisar Region of Turkey were determined in 2017. A total of 19 species of Scolytinae were collected from 8 different provinces at Afyonkarahisar. Hylastes ater Paykull, 1800, Hylesinus varius Fabricius, 1775, Hylurgus ligniperda (Fabricius, 1787), H. micklitzi Wachtl, 1881, Tomicus minör Hartig, 1834, Crypturgus pusillus Gyllenhal, 1813, Dryocoetes villosus (Fabricius 1792), Taphrorychus ramicola (Reitter, 1894), T. villifrons (Dufour, 1843), Ips sexdentatus Boerner, 1766, Ips mannsfeldi (Wachtl, 1880), Pityogenes bistridentatus Eichoff, 1878, Scolytus intricatus (Ratzeburg, 1837), S. mali (Bechstein 1805), Anisandrus dispar (Fabricius, 1792), Trypodendron signatum (Fabricius 1787), Xyleborus monographus (Fabricius, 1792), X. xylographus (Say, 1826) and Xyleborinus saxesenii (Ratzeburg, 1837) were recorded in Afyonkarahisar region. Among those, X.saxesenii was the more abundant species than the others.*

Keywords *- Scolytinae, fauna, host plant, forest trees, Afyonkarahisar region*

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I. INTRODUCTION

Pest insects are among the main factors which affect the health of forests in Turkey. They are always threats for forest ecosystems that are found in the focus of sustainable development. Scolytinae (Coleoptera: Curculionidae) is one of the most important group. Beetles belonging to this subfamily cause damage by destroying lignified parts and their development periods continue under bark.

Scolytinae subfamily is presented by 9978 species belonging to 288 genera of 33 tribe. The species of Scolytinae in Turkey are belonging to Hylesinitae and Scolytitae supertribes and a total 136 species were determined [1,2,3]. The adult beetles are the primary tunnellers and open galleries in the wood under the bark of a wide range of trees where the eggs are laid. The larvae then make small lateral galleries where they live and feed [4].

Forests of Afyonkarahisar region are subject to entomological problems every year and there are significant economic losses. Afyonkarahisar Forest Enterprise comprises Hocalar, Emirdağ, Sinanpaşa, Sandıklı, Çay, Afyon and Şuhut Forestry Chiefs. The overall area of the enterprise is 1154321.5 hectares. 14.7% of this area (169531.5 ha) is forest area [5]. This ratio is below the average of Turkey (27%).

The main forest tree species are, Anatolian Black pine (*Pinus nigra* Arnold), Scots pine (*P.sylvestris* L.), Anatolian chesnut (*Castanea sativa* Mill.) and Oak species (*Quercus* spp.). The widest distribution of these species is Anatolian Black pine. Among these, there are 75 hectares of Anatolian chestnut (*Castanea sativa* Mill.) forest, which was given the status of chestnut gene conservation forest in Sandıklı.

The number of trees being killed by Scolytinae species has increased significantly in recent years throughout the region. This increase has been observed especially in damaged forests where windstorms and snowy conditions had caused broken and windfall trees. In addition, outbreaks have been occurred at low quality sites during dry years when moisture stress increases the vulnerability to beetle attack.

There are some records of Scolytinae species especially associated with coniferous trees of Afyonkarahisar Region. The aim of this study was to determine the Scolytinae fauna and host plants of each species on forest trees of that region.

II. MATERIALS AND METHODS

Scolytinae species were collected from 8 sites displaying different forest characteristics in provinces of Afyonkarahisar which is situated in inner Aegean region of Turkey. For this aim, surveys were conducted throughout the forests of region in 2017. In addition, status of sites, altitude and geographical coordinates were also noted (Table 1).

Table 1. Collecting sites

No	Collecting site	Locations	Altitude (m)	Forest structure
1	Hocalar-Yağcı	X 4285911.71 Y 242038.73	1338	*Pinus nigra* forest (50-55 years old)
2	Afyonkarahisar-Selimiye	X 4318977.59 Y 299036.16	1100	*Pinus nigra* forest (30-40 years old)
3	Şuhut-Göynük	X 4295641.42 Y 317588.37	1342	*Pinus nigra* forest (40 years old)
4	Şuhut- Başören	X 4260536.00 Y 274636.38	1572	*Quercus pubescens* (100 years old)
5	Sandıklı-Karacaören	X 4264547.43 Y 266073.07	1200	*Castanea sativa* - *Pinus nigra* - *Quercus libani* mixed forest
6	Sandıklı-Kızılören	X 4236537.27 Y 249724.40	1187	*Quercus pubescens* stand
7	Sinanpaşa-Göçük mevki	X 4287784.22 Y 249298.08	1289	*Pinus nigra* forest (40 years old)
8	Sinanpaşa-Kılıçarslan mevki	X 4282957.74 Y 266871.95	1236	*Quercus pubescens* (50 years old)

Trees weakened by other insects or drought were used to determine the Scolytinae fauna. These trees were selected by observing damage symptom and signs like holes on bark, resin flows and yellowish or brownish color on crown etc. Trap woods were placed in coniferous forests and checked (Figure 1). Some species fly to the shoots of nearby trees for maturation feeding, so their shoots were checked for evidence of beetles and feding. Besides forest stands, specimens were also collected from trunks which waited in forest.

Figure 1. Trap woods

For determining to species that are fed on deciduous trees, the red winged sticky traps were set in stands and checked periodically. Traps consist of two red-colored and crosswise mounted sticky plates with a 1 liter white colored plastic bottle hanging just below and each wings of oblong sticky plates with adhesive glue has 15x21 cm size. Traps were placed on trees and checked from mid of March to beginning of October. They were placed 2-2.5 m above the ground and positioned 80-100 m from each other. Mix attractant which contains 96% alcohols and 1% toluen were used in traps. Checking was made weekly and traps were replaced with new ones at one month intervals.

Figure 2. The red winged sticky trap

All collected specimens were examined under microscope and species were determined.

III. RESULTS AND DISCUSSIONS

Based on the material collected from Afyonkarahisar region by examination on 2632 individuals during 2017, a total of 19 Scolytinae species belonging to 14 genera of 8 tribe were identified. The species are given below with their number of individuals (Table 2).

Table 2. Scolytinae species determined in Afyonkarahisar region and number of individuals

Supertribus	**Tribus**	**Tür**	
Hylesinitae Erichson, 1836			**Number**
	Hylastini LeConte, 1876		
		Hylastes ater Paykull, 1800	4
	Hylesinini Erichson, 1836	*Hylesinus varius* Fabricius, 1775	6
	Hylurgini Gistel, 1848		
		Hylurgus ligniperda (Fabricius, 1787)	102
		Hylurgus micklitzi Wachtl, 1881	89
		Tomicus minör Hartig, 1834	186
Scolytitae Latreille, 1804			
	Crypturgini LeConte, 1876		
		Crypturgus pusillus Gyllenhal, 1813	4
	Dryocoetini Lindemann, 1876		
		Dryocoetes villosus (Fabricius 1792)	3
		Taphrorychus ramicola (Reitter, 1894)	42
		Taphrorychus villifrons (Dufour, 1843)	29
	Ipini Bedel, 1888		
		Ips sexdentatus Boerner, 1766	423
		Ips mannsfeldi (Wachtl, 1880)	291
		Pityogenes bistridentatus Eichoff, 1878	192
	Scolytini Geoffroy, 1762		
		Scolytus intricatus (Ratzeburg, 1837)	7
		Scolytus mali (Bechstein 1805)	6
	Xyleborini LeConte, 1876		
		Anisandrus dispar (Fabricius, 1792)	314

		Trypodendron signatum (Fabricius 1787)	6
		Xyleborus monographus (Fabricius, 1792)	27
		Xyleborus xylographus (Say, 1826)	5
		Xyleborinus saxesenii (Ratzeburg, 1837)	896
	Total		2632

Among these species, *Hylastes ater* Paykull, 1800, *Hylesinus varius* Fabricius, 1775, *Crypturgus pusillus* Gyllenhal, 1813, *Dryocoetes villosus* (Fabricius 1792), *Taphrorychus ramicola* (Reitter, 1894), *T. villifrons* (Dufour, 1843), *Ips mannsfeldi* (Wachtl, 1880), *Pityogenes bistridentatus* Eichoff, 1878, *Scolytus intricatus* (Ratzeburg, 1837), *S. mali* (Bechstein 1805), *Anisandrus dispar* (Fabricius, 1792), *Trypodendron signatum* (Fabricius 1787), *Xyleborus monographus* (Fabricius, 1792), *X. xylographus* (Say, 1826) and *Xyleborinus saxesenii* (Ratzeburg, 1837) were recorded for the first time for Afyonkarahisar region of Turkey. Among those, *X.saxesenii* was the more abundant species than the others. The species of *I. sexdentatus*, *A. dispar* and *I. mannsfeldi* were followed it respectively. Turkish records for collected species which were reported in previous studies are given in Table 3.

Table 3. Turkish records in previous studies for collected species

Species	**Turkish Records**	
	Host species	**Distribution**
Hylastes ater Paykull, 1800	*Fraxinus excelsior*	Bursa
Hylesinus varius Fabricius, 1775	*Fraxinus excelsior, F. ornus, F. americana, Olea europaea, Robinia pseudoacacia*	Bursa, Hatay, Isparta, İstanbul,
Hylurgus ligniperda (Fabricius, 1787)	*Pinus sylvestris, P. nigra, P. halepensis, P. brutia, P. pinaster, P. pinea*	Afyonkarahisar, Burdur, Bursa, Eskişehir, Isparta, İzmir
Hylurgus micklitzi Wachtl, 1881	*Pinus halepensis, P. pinaster, P. pinea, P. nigra*	Afyonkarahisar, Antalya, Burdur, Isparta, İzmit
Tomicus minör Hartig, 1834	*Pinus sylvestris, P. nigra, P. brutia, Picea orientalis*	Afyonkarahisar, Amasya, Ankara, Antalya, Bolu, Burdur, Bursa, Erzurum, Eskişehir, Isparta, İzmir, Karabük, Konya, Muğla
Crypturgus pusillus Gyllenhal, 1813	*Abies nordmaniana, Cedrus libani, Picea orientalis, Pinus brutia, P. nigra, P. pinea, P. sylvestris*	Antalya, Artvin, Bolu, Bursa, Denizli, Giresun, Isparta, Muğla, Ordu, Tokat, Trabzon, Uşak
Dryocoetes villosus (Fabricius 1792)	*Castanea sativa, Fagus orientalis*	Artvin, Bursa, Kahramanmaraş, Sakarya, Trabzon
Taphrorychus ramicola (Reitter, 1894)	*Carpinus orientalis, Corylus avellana, Fagus. orientalis, Quercus cerris*	Hatay, Isparta, Kahramanmaraş
Taphrorychus villifrons (Dufour, 1843)	*Carpinus betulus, Fagus orientalis, Quercus cerris, Q. frainetto, Liquidambar orientalis*	Amasya, Ankara, Bolu, Bursa, Hatay, Isparta, İstanbul, Kahramanmaraş, Karabük, Sakarya, Sinop, Tokat
Ips sexdentatus Boerner, 1766	*Pinus sylvestris, P. nigra, P. brutia, Picea orientalis, Abies nordmanniana* subsp. *bornmulleriana, A. nordmanniana* subsp. *nordmanniana*	Afyonkarahisar, Ankara, Artvin, Balıkesir, Bolu, Burdur, Bursa, Denizli, Düzce, Erzurum, Eskişehir, Giresun, Isparta, İzmir, Karabük, Kastamonu, Manisa, Muğla, Rize, Samsun, Sinop, Trabzon
Ips mannsfeldi (Wachtl, 1880)	*Pinus nigra, P. sylvestris*	Adana, Amasya, Antalya, Bursa, Denizli, Isparta, Karabük, Mersin, Muğla
Pityogenes bistridentatus Eichoff, 1878	*Cedrus libani Pinus nigra, P. pinaster, P. brutia, Picea orientalis*	Artvin, Antalya, Bursa, Denizli, Edirne, Isparta, Muğla
Scolytus intricatus (Ratzeburg, 1837)	*Fagus orientalis, Ostrya carpinifolia, Quercus cerris, Q. frainetto, Q. petraea, Q. robur*	Düzce, Hatay, Isparta, İstanbul, Kahramanmaraş, Sinop
Scolytus mali (Bechstein 1805)	*Prunus armeniaca, P. avium, P. domestica, P. persica, Pyrus communis, Malus domestica, Cydonia oblonga*	Amasya, Ankara, Bolu, Isparta, İstanbul, Kahramanmaraş, Samsun
Anisandrus dispar (Fabricius, 1792)	*Actinidia chinensis, Carpinus betulus, Castanea sativa, Corylus avellana, Fagus orientalis, Malus domestica, Populus nigra, Prunus cerasus, Quercus* sp., *Tilia* sp., *Ulmus* sp.	Adana, Ankara, Artvin, Bartın, Bolu, Bursa, Corum, Denizli, Giresun, Gümüşhane, Hatay, Isparta, İstanbul, Karabük, Kahramanmaraş, Kastamonu, Muğla, Niğde, Ordu, Rize, Sakarya, Samsun, Trabzon, Zonguldak
Trypodendron signatum (Fabricius 1787)	*Quercus* sp., *Fagus orientalis, Alnus* sp.	Bolu, Gümüşhane, Isparta, İstanbul, Kahramanmaraş, Karabük, Sakarya,

		Sinop, Trabzon
Xyleborus monographus (Fabricius, 1792)	*Castanea sativa, Fagus orientalis, Quercus frainetto*	Bursa, Hatay, İstanbul, Kahramanmaraş
Xyleborus xylographus (Say, 1826)	*Abies cilicica, Alnus* sp., *Corylus avellana, Fagus orientalis, Ficus carica, Juglans regia, Liquidambar orientalis, Prunus armeniaca, P. avium, Pyrus communis, Quercus cerris*	Amasya, Antalya, Hatay, Kahramanmaraş, Mersin, Muğla, Samsun, Trabzon
Xyleborinus saxesenii (Ratzeburg, 1837)	*Abies cilicica, A. nordmanniana* subsp. *bornmuelleriana, Actinidia chinensis, Alnus* sp., *Cedrus libani, Corylus avellana, Fagus orientalis, Ficus carica, Fraxinus ornus, Juglans regia, Juniperus excelsa, Liquidambar orientalis, Pinus nigra, Prunus armeniaca, P. avium, Pyrus communis, Quercus cerris*	Amasya, Antalya, Artvin, Bolu, Düzce, Giresun, Hatay, Isparta, İstanbul, Kahramanmaraş, Kocaeli, Konya, Mersin, Muğla, Ordu, Rize, Sakarya, Samsun, Sinop, Trabzon, Zonguldak

* Distribution and host species records were arranged based on the following literature: [6-21]

Ips sexdentatus was the most common species. It was exist in 5 sites. And also, *I. mannsfeldi* and *Xyleborinus saxesenii* were collected from 4 sites. Among collected species, *Hylastes ater*, *Hylurgus ligniperda*, *H. micklitzi*, *Tomicus minor*, *Crypturgus pusillus*, *I.sexdentatus*, *I. mannsfeldi* and *Pityogenes bistridentatus* were found only on Anatolian Black pine (*Pinus nigra*). Also, *Hylesinus varius*, *Taphrorychus ramicola*, *Scolytus mali* and *Trypodendron signatum* were determined only on Pubescent oak (*Quercus pubescens*). *T. villifrons*, *Scolytus intricatus* and *Xyleborus monographus* were collected both *Quercus pubescens* and *Castanea sativa* stands. By the way, *Anisandrus dispar* was found on both *Quercus pubescens* and *Q.libani*. And also, *Dryocoetes villosus* was only on C.*sativa* and *X. xylographus* on *Q.libani*.

Table 4. Distribution and host plants of Scolytinae species in Afyonkarahisar region

Collection Sites / Collected Species			*Hylastes ater*	*Hylesinus varius*	*Hylurgus ligniperda*	*Hylurgus micklitzi*	*Tomicus minor*	*Crypturgus pusillus*	*Dryocoetes villosus*	*Taphrorychus ramicola*	*Taphrorychus villifrons*	*Ips sexdentatus*	*Ips mannsfeldi*	*Pityogenes bistridentatus*	*Scolytus intricatus*	*Scolytus mali*	*Anisandrus dispar*	*Xyleborus monographus*	*Trypodendron signatum*	*Xyleborus xylographus*	*Xyleborinus saxesenii*
Afyonkarahisar	**No**																				
	01	Hocalar-Yağcı	●		●	●	●					●	●	●							
	02	Afyonkarahisar-Selimiye					●					●	●								
	03	Şuhut-Göynük			●	●						●	●	●							
	04	Şuhut- Başören													▲	▲	▲	▲			▲
	05	Sandıklı-Karacaören	●					●	■		■	●			■		♦	■		♦	♦
	06	Sandıklı-Kızılören		▲																	▲
	07	Sinanpaşa-Göçük mevki			●		●					●	●	●			▲				
	08	Sinanpaşa-Kılıçarslan mevki								▲	▲								▲		▲

Host Plant ● *Pinus nigra* ■ *Castanea sativa* ▲ *Quercus pubescens* ♦ *Quercus libani*

IV. CONCLUSION

In conclusion, bark beetles are very important pests for forests of Afyonkarahisar region by their damage. A lot of dead trees were observed and trees weakened by Scolytinae species. Also, studies on Scolytinae beetles that are spreading on especially deciduous trees are very limited in Turkish forests. It is evident that many more bark beetle species will be discovered on forest trees when similar fieldwork using different collecting methods is conducted in Afyonkarahisar and elsewhere in Turkey. It is hoped that current data will be contributed other studies that will be carried out both in other locations of country.

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