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Observations on the Flight Activities of Two Ambrosia Beetles *Anisandrus dispar* (Fabricius, 1792) and *Xyleborinus saxesenii* (Ratzeburg, 1837) in Kasnak Oak Forest Nature Protection Area in the South Western of Turkey

Oğuzhan SARIKAYA
Suleyman Demirel University, Faculty of Forestry,
Isparta, 32260, Turkey
Email: oguzhansarikaya@sdu.edu.tr

Hüseyin SAYIN
Zonguldak Forestry Regional Directorate,
Zonguldak, Turkey
Email: sayinhuseyin@hotmail.com

***Abstract* – This study was conducted to determine flight activities of ambrosia beetles *Anisandrus dispar* (Fabricius, 1792) and *Xyleborinus saxesenii* (Ratzeburg, 1837) in Kasnak Oak Forest Nature Protection Area in 2012 and 2013 by using red winged sticky traps. As the result of the study, it was determined that flying period of *A. dispar* starts in the first half of April and continued till mid of August. *X. saxesenii* adults were started to seen in the second week of April and the active flying period of *X. saxesenii* continued to till the end of September.**

***Keywords* – *Anisandrus dispar*, *Xyleborinus saxesenii*, Kasnak Oak Forest Nature Protected Area, Flying Activity.**

I. Introduction

Kasnak Oak Nature Protection Area is situated in Isparta-Yukarıgökdere province of the south western of Turkey. This area contains the only natural forest of Kasnak oak [*Quercus vulcanica* (Boiss. & Heldr. ex) Kotschy)] in the world. Due to best forest stands of *Q. vulcanica* that is endemic, rare and endangered species, this forest was established as Kasnak Oak Nature Protection Area. *Q. vulcanica* constitutes pure and mixed forests with deciduous and coniferous species.

Ambrosia beetles can cause damages especially on deciduous trees. These are a specialized group belonging to the subfamily Scolytinae (Col.: Curculionidae). Ambrosia beetles could have economically importance by their creating galleries in timber and transporting pathogenic fungi to other living trees during feeding periods [1]. They differ from the bark beetles with some characteristics. Bark beetles feed under bark on the surface of the wood on phloem tissue, while ambrosia beetles enter into the wood and cultivate and feed on fungus in the galleries. Also, many ambrosia beetles have symbiotic relationship with fungus. Both the adults and larvae feed on the fungus [2].

Anisandrus dispar (Fabricius, 1792) and *Xyleborinus saxesenii* (Ratzeburg, 1837) which flight activities were studied, have wide distribution. *A. dispar* is spreading in USA, Canada, Europea, Japan, Russia, Korea, India and Mongolia on *Acer* sp., *Actinidia chinensis*, *Aesculus* sp., *Alnus* sp., *Betula* sp., *Carpinus betulus*, *Castanea sativa*, *Corylus avellana*, *Crataegus* sp., *Cydonia* sp., *Fagus sylvatica* subsp. *sylvatica*, *Fraxinus* sp., *Juglans regia*, *Malus domestica*, *Pinus radiata*, *Platanus* sp., *Populus nigra*, *Prunus cerasus*, *P. domestica*, *Punica* sp., *Pyrus* sp., *Quercus* sp., *Quercus cerris*, *Q. frainetto*, *Q. petraea*, *Robinia* sp., *Sorbus aucuparia*, *Tilia tomentosa*, *Ulmus* sp. and *Vitis vinivera* [3-17]

Xyleborinus saxesenii was determined in USA, Canada, Europe, North Africa, China, Russia, Korea, India, Iran, Japan, Caucasus, Canary Islands, Egypt, Mongolia, and New Zealand on *Abies* sp., *Acacia* sp., *Araucaria* sp., *Betula* sp., *Camellia* sp., *Carpinus betulus*, *Castanea mollissima*, *Chamaecyparis* sp., *Cupressus* sp., *Eucalyptus* sp., *Fagus sylvatica*, *Fraxinus* sp., *Juglans regia*, *Larix* sp., *Malus* sp., *Pinus* sp., *Populus* sp., *Prunus* sp., *Pyrus* sp., *Quercus cerris*, *Q. petraea*, *Q. robur*, *Tilia cordata*, *Tsuga* sp., *Ulmus* sp. and *Weinmannia racemosa* [7], [18-22].

II. Material and Methods

Research Area

The study was carried out during 2012 and 2013 at Kasnak Oak Nature Protection Area (37° 43' N, 30° 49' E) located in Eğirdir province of Isparta in the western part of the Mediterranean region of Turkey (Figure 1).

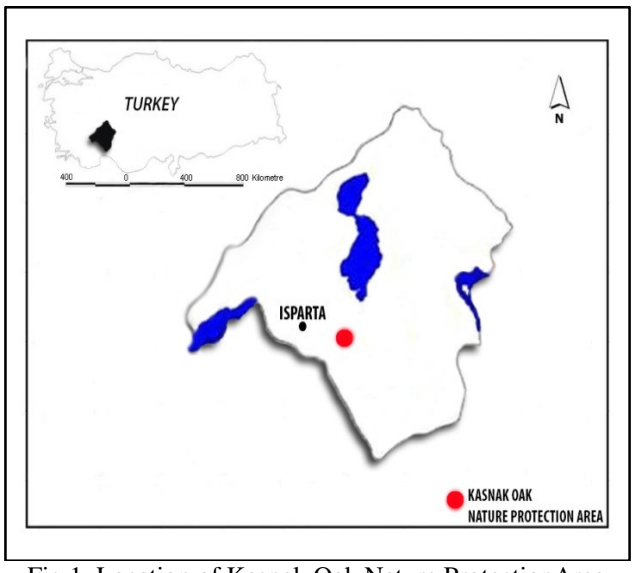

Fig.1. Location of Kasnak Oak Nature ProtectionArea

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Kasnak Oak Nature Protection Area has total 1300.5 hectares and located 5 km away from Yukarıgökdere Village of Eğirdir County. Davras Mountain is located in the western side of stand. Also, Eğirdir Lake and Eğirdir county were situated on northern side. Altitudes are varying between 1200 m and 1900 m.

Quercus vulcanica is the dominant species in area although many other forest trees are exist as individual or mixed with Kasnak oak. Important species are *Cedrus libani* Rich, *Pinus nigra* L., *P. brutia* Ten., *Abies cilicica* Carr., *Juniperus oxycedrus* L., *J. foetidissima* Willd., *J. excelsa* Bieb., *Quercus cerris* L., *Q. libani* Oliv., *Q. coccifera* L., *Q. infectoria* Oliv., *Q. pubescens* Willd., *Q. frainetto* Ten., *Q. trojana* Webb., *Acer platanoides* L., *A. hyrcanum* Fisher & Meyer, *A. monspessulanum* L., *Fraxinus ornus* L., *F. oxycarpa* Bieb., *Sorbus torminalis* (L.), *Populus tremula* L., *Salix alba* L., *Ulmus glabra* L., *Ostrya carpinifolia* Scop., *Celtis orientalis* L., *Pistacia terebinthus* L., *Cornus mas* L., *Styrax officinalis* L., *Phillyrea latifolia* L. and *Sambucus ebulus* L. [23- 25].

Monitoring to population fluctuations

The red winged sticky traps were used for determining the flight activities of *Anisandrus dispar* and *Xyleborinus saxesenii*. 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. Total 20 traps were placed and checked from mid of March to beginning of October. They were placed 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.

III. Results and Discussion

First adults of *A. dispar* were detected in the red winged sticky traps during 2012 and 2013 starting from the first half of April. A significant increase was observed in the number of adult beetles trapped when the average temperature was above 16 ºC, which usually corresponded to the second half of May. Depending on climate, it was observed that the number of beetles trapped increased significantly till the third week of May. After this date, the trap is seen to gradually decrease in the number of adults falling; it was found that the active flight period continued until mid of August (Figure 2 and 3).

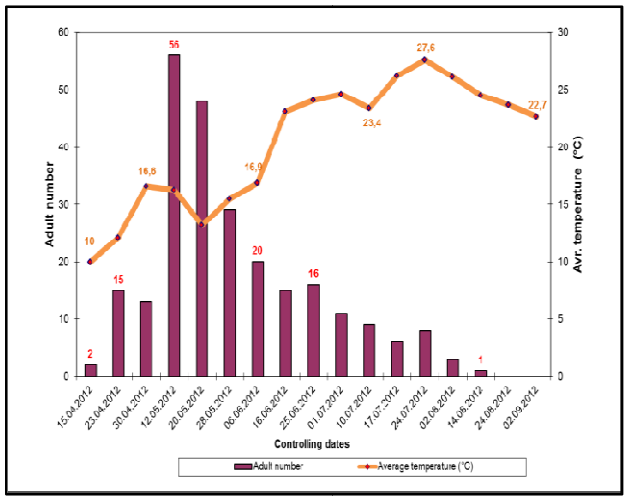

Fig.2. Flight activity of *Anisandrusdispar* in 2012

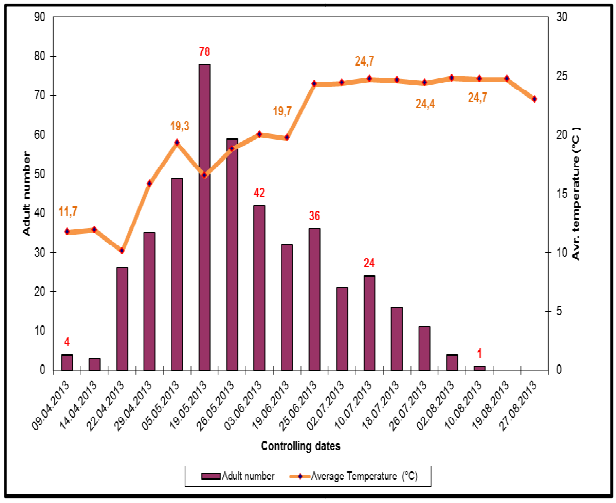

Fig.3. Flight activity of *Anisandrus dispar* in 2013

X. saxesenii adults were started to seen in the second week of April in traps for both years. The number of adults increased depending on temperature rise and the population reached to max. level in the second half August when the average temperature was above 24 ºC. The active flying period of beetle continued to till the end of September (Figure 4 and 5).

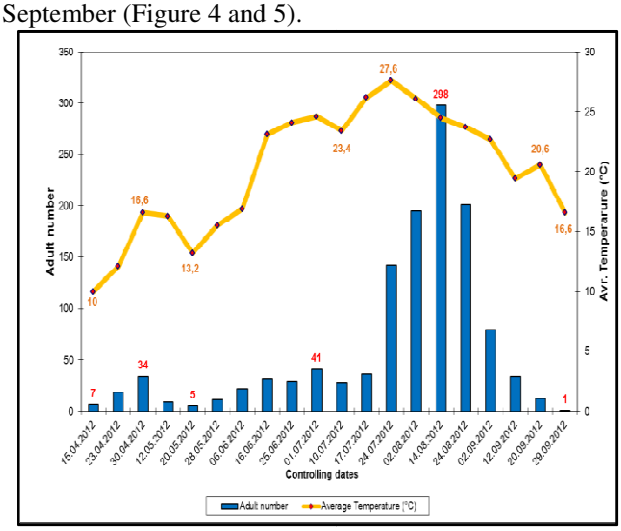

Fig. 4. Flight activity of *Xyleborinussaxeseniiin* 2012

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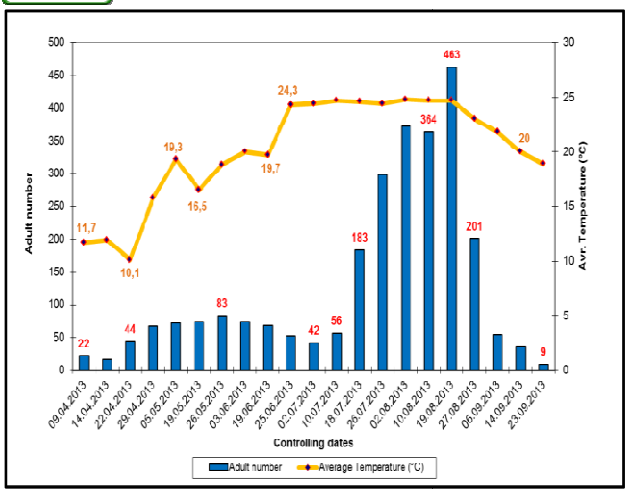

Fig.5. Flight activity of *Xyleborinus saxesenii*in 2013

Our findings has similarities between a study [26] which was conducted in Samsun and Ordu region where is located northern part of Turkey near Black Sea. They stated that *A. dispar* emerged in large numbers in spring (March - May) as overwintered adults; *X. saxesenii* emerged in large numbers in summer (June - August). Also, Population density of *A. dispar* reached to max. Level in the mid of May, whereas beginning of September for *X. saxesenii*.

During the study [9] which was conducted in *Quercus frainetto* stands of Greece, it was determined that the flying period of *A. dispar* started in the last period of March and continued to mid of August and population reached to peak point in the beginning of May. In same study, the flying period of *Xyleborinus saxesenii* was observed to start in the end of March and continued till mid of October. The population of beetle increased till mid of May and continued to decreasing till beginning of August and make a remarkable increasing in mid of August.

Adults of *A. dispar* started to fall in traps in the beginning of May, reached to peak in the third week of June and active flying period continued till the beginning of September during the studies which was conducted between 1997 and 1999 in different orchards of Bursa region located in the north western part of Turkey [27].

It was determined that the flying period of *X. saxesenii* started in the second half of March in lower altitudes (180-550 m) of Isparta region during a study which was conducted in Sweetgum (*Liquidambar orientalis*) Nature Protection Area in 2012 and 2013. Population was observed to reach max. point in the beginning of August [13]. Results of aforementioned study showed that flying period of *X. saxesenii* actualized two week earlier in lower altitudes. This is due to the differences in elevation and average temperature.

Flying period of *X. saxesenii* was started in the beginning of August and population reached to peak in the end of same month in Washington – USA [28]. Also, the active flying period was observed to continue till the second week of November. Results of that study are dissimilar from our findings as well as other studies conducted in Europe.

IV. Conclusion

The results of this study indicated that ambrosia beetles are important group in forests especially constituted by deciduous trees in the Western Mediterranean region However, there are no detailed studies about the ambrosia beetles and their damage on deciduous trees of Protected Areas in Turkey. Detailed studies should be conducted for filling these gaps.

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AUTHOR'S PROFILE

Assoc. Prof.
Dr. Oğuzhan SARIKAYA
has completed his PhD studies from Suleyman Demirel University, Faculty of Forestry in 2008 on Forest Entomology. He has many studies on bark and ambrosia beetles and other forest pests. He became Associate Professor in 2015.

Hüseyin SAYIN
has completed his M.Sc. from Suleyman Demirel University, Faculty of Forestry in 2014 on Forest Entomology.