



Three new epidemic areas of *Tomicus destruens* (Wollaston 1865) (Coleoptera: Curculionidae, Scolytinae) in Eastern Mediterranean part of Turkey

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Abstract: The species of *Tomicus* genus, which are noteworthy for their damage in pine forests in Europe, North America, Asia and North Africa, also cause significant damages in pine forests of Turkish forests. The *Tomicus* is represented by 3 different species which are defined in Turkey throughout. It was recently believed that *Tomicus piniperda* (Linnaeus 1785) attacked to *Pinus brutia* and rarely to *P. nigra* trees in the Mediterranean basin of Turkey. For this reason, *T. piniperda* was reported as responsible for epidemic that occurred in the Mediterranean basin of Turkey. However, recent studies have determined that species as *T. destruens* which is very similar with *T. piniperda* as morphologically. By the way, *T. destruens* has shown biologically significant differences from *T. piniperda*. In this study, three different epidemics of *T. destruens* were evaluated in 3 different *P. brutia* forest stands of Adana (Ceyhan, 30 m, 30 ha), Mersin (Anamur, 600 m, 42 ha) and Osmaniye (Hasanbeyli, 780 m, 50 ha), in the Eastern part of Mediterranean region of Turkey. This outbreak occurred in 122 ha. It has been observed that beetle predominates *P. brutia* in the whole area. At both 30 m and 780 m altitudes, it is observed that the young adult exits still continued on the last week of March, and the adult entrances were still continuing in the prepared trappings. *Aulonium ruficornae* (Col.: Colydiidae), *Corticium fraxini* (Col.: Tenebrionidae), *Cylister elongatus* (Col.: Histeridae), *Raphidia ophiopsis* (Neur.: Raphidiidae), *Temnochila coerulea* (Col.: Trogossitidae) and *Thanasimus formicarius* (Col.: Cleridae) were determined as natural enemies of *T. destruens* in outbreak stands. Most abundant predator species was *T. formicarius*. On the other hand, these samples were found first time in the Çamlıyayla-Belçınarı village (790 m), Çamlıyayla-Kızılkaya (950 m) village, Çamlıyayla-Boztepe village (900 m), Erdemli-Karahıdırlı village (532 m), Mut (350 m) and Silifke-Çandırlı village (613 m) of the Mersin province.

Keywords: Eastern Mediterranean, Epidemic, *Tomicus destruens*, Turkey.

1. Introduction

Bark beetles are among the most harmful species of coniferous forests through the World. Many species have secondary characteristic. Adults prefer weakened trees by physiologically. The plant materials are suitable materials by constituted abiotic conditions like snow broken, fallen trees by wind and forest fires. Aggressive species can make epidemics and also change the situation and functions of forests in range areas.

The species of *Tomicus* genus, which are noteworthy for their damage in pine forests in Europe, North America, Asia and North Africa. *Tomicus* genus is represented by 8 species in the world. These species are *Tomicus piniperda* (Linnaeus, 1758), *T. minor* (Hartig, 1834), *T. destruens* (Wollaston, 1865), *T. puellus* (Reitter, 1894), *T. pilifer* (Spessivtsev, 1919), *T. brevipilosus* (Eggers, 1929), *T. yunnanensis* (Kirkendall ve Faccoli, 2008) and *T. armandii* (Li and Zhang, 2010; Kirkendall et al., 2008, Li et al., 2010).

The *Tomicus* is represented by 3 different species which are defined in Turkey. This species are *T. piniperda*, *T. minör* and *T. destruens* (Sarıkaya and Avcı, 2010). In 1865, *T. destruens* was described as a different species by Wollaston (Wollaston, 1865). After the studies of Schedl, who rejected this species status (Schedl, 1932; Schedl, 1946), *T. piniperda* and *T. destruens* species were considered to be synonyms for many years (Faccoli, 2006). However, as a result of the studies of Lekander (1971) on the morphologic characters of larvae, and the morphologic and genetic studies of Gallego and Galián (2001); Kohlmayr et al. (2002) and Kerdelhue et al. (2002), *T. piniperda* and *T. destruens* were described as different species.

It was recently believed that *Tomicus piniperda* (Linnaeus 1785) attacked to *Pinus brutia* and rarely to *P. nigra* trees in the Mediterranean basin of Turkey. For this reason, *T. piniperda* was reported as responsible for epidemic that occurred in the Mediterranean basin of Turkey. However, recent studies have determined that species as *T. destruens* which is very similar with *T. piniperda* as morphologically. By the way, *T. destruens* has shown biologically significant differences from *T. piniperda*.

The numbers of drying trees in *P. brutia* and *P. nigra* forests in the Western Mediterranean region in Turkey have increased in recent years because of *T. destruens* damage (Sarıkaya and Avcı, 2007). This situation is also seen in the *P. brutia* forests in the Eastern Mediterranean region of Turkey. In this presentation, outbreaks by *T. destruens* in three different regions of the Eastern Mediterranean region in 2017 were discussed and the findings were shared.

2. Material and methods

This study was conducted in epidemic stands of *T. destruens* in pine forests that are situated in Eastern Mediterranean region between 2016 and 2017 (Fig.1). Standing trees that were attacked by *T. destruens* and trap woods were investigated. Biological terms, flight periods of adults and natural enemies were recorded.



Figure-1. Study area, Eastern Mediterranean region of Turkey (Map:produced from GoogleMap, 2017)

3. Results and discussion

As the results of study, three different epidemics of *T. destruens* were evaluated in 3 different *P. brutia* forest stands of Adana, Mersin and Osmaniye provinces of the Eastern part of Mediterranean region of Turkey in 2017.

3.1. Turkish red pine forest of Ceyhan

Turkish red pine forest of Ceyhan district in Adana province is first epidemic area of *T. destruens*. The forest is 45 years old and includes pure Turkish red pine. This forest is on 30 m above from sea level. This forest is an independent stand in the form of an island in the middle of the Ceyhan plain. The closest forest area is 17 km away from stand. The damages of *T. destruens* were observed on 30 ha area of 45 ha totally (Fig.2).



Figure-2. Epidemic area of *Tomicus destruens* in Ceyhan district in Adana province (Map:produced from GoogleMap, 2017)

It was observed in 31.03.2017, adults emerging were almost finished on trap trees which were set in November 2016. Young adults were light yellowish color. Mature larvae of *T. destruens* and also white color pupae that settled mostly in bark were observed under bark of trap trees which were set in 16.02.2017 (Fig.3).

During the observations on trap trees that were set in 18.03.2017, a few number *T. destruens* adults who have just arrived were seen. Also, young larvae were observed under bark of same trap trees. The observation of the adults of *T. destruens* still have on the main gallery of the same nest, is another finding.

Natural enemies in Ceyhan stand

Cylister elongatus (Col.:Histeridae), *Raphidia ophiopsis* (Neur.: Raphidiidae) (Fig.3E) and *Thanasimus formicarius* (Col.: Cleridae) were determined as natural enemies of *T. destruens* in outbreak stands.

C. elongates and *T. formicarius* were caught in the mature larval stage of *R. ophiopsis* despite being caught as adults. The adult of *C. elongates* and also mature larvae of *R. ophiopsis* were found on the Turkish red pine trap trees that were set in November 2016. By the way, the adults of *T. formicarius* were found on yet set trap trees (16.02.2017 and 18.03.2017). The most abundant predator species were found as *T. formicarius* in this stand.



Figure-3. *Tomicus destruens* A) young adult, B) older adult, C) pupae, D) Adult and larval galleries in the bark of Turkish red pine, E) Larvae of *Raphidia ophiopsis* in adult galleries.

3.2. Turkish red pine forest of Anamur

Turkish red pine forest of Anamur district in Mersin province is second epidemic area of *T. destruens* for Eastern part of the Mediterranean region of Turkey. The forest includes pure Turkish red pine and situated above 600 m from sea level. The damage of *T. destruens* was including approximately 42 hectares (Fig.4). During the observation which conducted in 07.04.2017, larvae were seen under bark of trap tree that was set on 12.03.2017

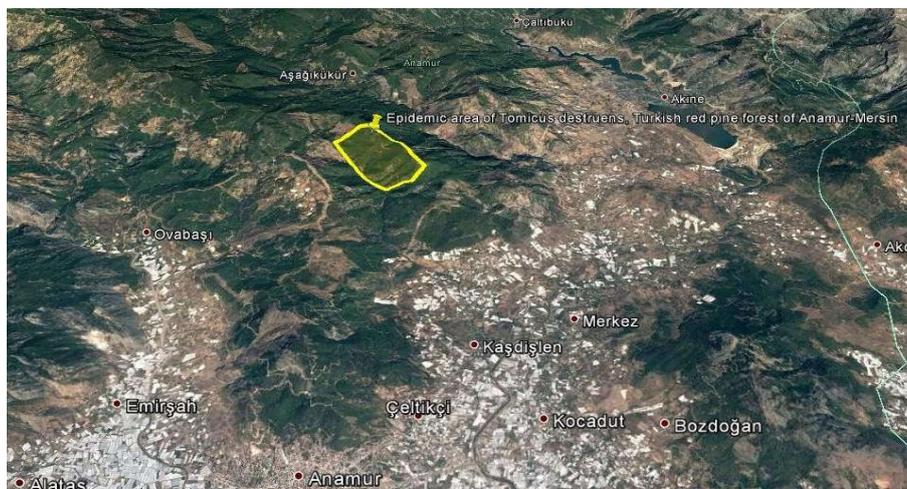


Figure-4. Epidemic area of *Tomicus destruens* in Anamur district in Mersin province (Map:produced from GoogleMap, 2017)

Natural enemies in Anamur stand

The adults of *Aulonium ruficorne* (Col.: Colydiidae) and *Corticus fraxini* (Col.: Tenebrionidae) and also mature larvae of *R. ophiopsis* were observed on the larva galleries of *T. destruens*. The adults of *Temnochila coerulea* (Col.: Trogossitidae) and *T. formicarius* (Col.: Cleridae) were recorded as natural enemies on bark and crevices. *T. coerulea* and *T. formicarius* were found as most common species.

3.3. Turkish red pine forest of Hasanbeyli

Turkish red pine forest of Hasanbeyli district in Osmaniye province is third epidemic area of *T. destruens* (Fig.5). The forest is 37 years old and includes pure Turkish red pine. This stand was established by plantation in 1980. It was recorded that *T. destruens* have caused outbreaks since 4 years. It was stated that it could not get a successful result against these outbreaks. On official records it was reported that the species name of the harmful species is *T. piniperda*. It is estimated that the controlling has not been successful due to the application of the control methods specific to the field *T. piniperda*.

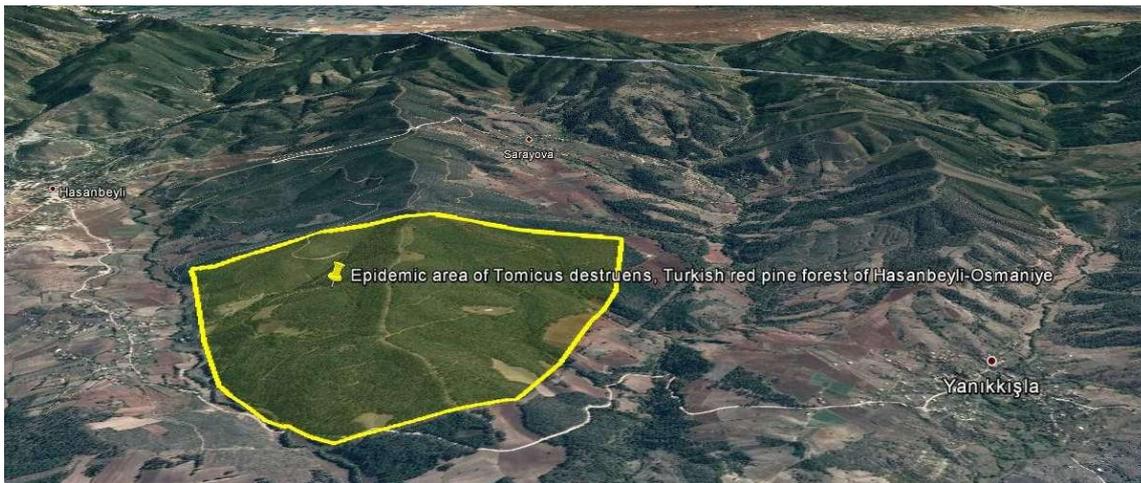


Figure-5. Epidemic area of *Tomicus destruens* in Hasanbeyli district in Osmaniye province (Map:produced from GoogleMap, 2017)

During the observations in 31.03.2017 on trap trees that were set in 16.03.2017, adults that were opening main galleries and larvae were hatching. The adults were seen on main galleries yet. Further, young adults that were coming on to barks were seen.

Natural enemies in Hasanbeyli stand

A lot of *T. coerulea* and *T. formicarius* adults were found among bark crevices. A few number *A. ruficorne* and *C. fraxini* adults were seen under bark. Also, only one young larva was found near *T. destruens* nest.

3.4. Other observations

T. destruens specimens were found the first time in Çamlıyayla-Belçınarı (790 m), Çamlıyayla-Kızılkaya (950 m), Çamlıyayla-Boztepe (900 m), Erdemli-Karahıdırlı (532 m), Mut (350 m) and Silifke-Çandırlı (613 m) villages during the survey studies which were conducted in 2017. Among these stands, the populations of *T. destruens* were observed in high levels. For this reason, it is estimated that *T. destruens* outbreaks could occur in these areas if adequate measures are not taken

4. Conclusions

It is necessary to investigate the presence of *T. destruens*, including the larch forest zone where this moult over 1000 m starting from the shoreline where Turkish red pine has spread in the Eastern Mediterranean region. This will also confirm the records of *T. piniperda* in the previous years, which will ensure the formation of healthier data for both cadaver distributions. And it will also help to identify the potential epidemic areas of *T. destruens*.

In previous studies, Sarıkaya and Avcı (2007) stated that *T. destruens* is univoltine in Turkey. Saide et al. (2016) reported that also this species has one generation in Balıkesir region. Similarly, *T. destruens* was found as univoltine in Israil, Algaria, Tunisia and Italy (Masutti 1969; Dajoz, 1980; Mendel et al. 1985; Chakali, 1992; Ben Jamâa et al., 2000; Faccoli et al., 2005). By the way, Russo (1940); Nanni and Tiberi (1997) and Masutti and Zangheri (2001) stated that it has two generations and also Davis et al. (2013) mentioned that it can be up to three times a year.

In this context, a detailed investigation of the biology information of *T. destruens* in the Eastern Mediterranean region will be the basis for the control methods against it. This will contribute to the prevention of the deaths of predominantly Turkish red pine and rarely Anatolian Black pine trees in the region.

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