**Tomicus destruens** (Wollaston): biology and behaviour in Central Italy

CATIA NANNI* AND RIZIERO TIBERI**

*Plant Protection Service - Emilia Romagna, Servizio fitosanitario regionale, via corticella 133,
I-40129 Bologna, Italy

** Forest and Agricultural Pathology and Zoology Institute, Florence, Italy

**ABSTRACT** The symptoms of decline that increase in Italian coastal pinewoods are caused by abiotic and biotic factors with the scolytid *Tomicus destruens* playing a leading role. Frequent and repeated physiological stresses, such as drought, climatic and ground water anomalies, phytophagous infestations (by sucking and defoliating insects) and fungal infections, have promoted the demographic increase of this endemic bark beetle. Like those of the others Tomicina, *T. destruens* infestations are very detrimental to the host because adults have to feed on the shoots of vigorous plants to enable their gonads to mature. Shoot death causes physiological anomalies and makes the plants vulnerable to subsequent attacks. In Central and Northern Italy, *T. destruens* develops two overlapping generations a year. The overlap in generations also occurs during hibernation, when adults, pupae, larvae and sometimes eggs have been observed at the same time. No significant difference has been observed concerning the biology of *T. destruens* in Central and Northern Italy, except that in the Northern Adriatic area mostly adults overwinter, in the shoots or in the stumps. These *T. destruens* biological characteristics greatly complicate pest management, which is already difficult in natural areas.

**KEY WORDS** *Tomicus destruens*, biology, behaviour, control

*TOMICUS DESTRUENS* (WOLLASTON), Coleoptera Scolytidae, which some authors still regard as a *Tomicus piniperda* L. termophile entity (Santini and Prestininzi 1991), is spread throughout the Mediterranean coastal area, and like the other *Tomicina* that are present in Italy, its preferred host are of the genus *Pinus*, especially, *P. halepensis* and *P. pinea*.

During the last few years, the coastal pinewoods of Central and Northern Italy have endured intense infestations from *T. destruens*. The high susceptibility of these biocoenoses to infestation appears to be connected with climatic and ground water unbalances that have caused physiological stress to the trees and have led to intense and repeated attacks by phytophagous insects and pathogenic agents (above all fungi) (Moriondo et al. 1995).

The purpose of the research was to study the role of *T. destruens* in the phenomena leading to the decline of pine stands and to define more precisely some aspects of their biology. The overall objective is to develop a programme for a rational and effective control.

**Materials And Methods**

The research was initiated in 1992, at two sites: in pine stands situated on the Tirrenic coast of Central Italy (Alberese, situated in Uccellina Park, and Feniglia on the Argentario...
promontory); and in pine stands of the North Adriatic coast (Cervia and Classe, both situated in Po Delta Park).

The forests under examination consist of unevenaged _P. pinea_, with isolated plants or sporadic groups of _P. pinaster_, and broad-leaved trees. In the Tirrenic pine forests, the broad-leaved trees are present within relatively small groups of evergreen species, while in the Adriatic pine forests they are more frequent, represented by species such as _Quercus robur_, _Q. pubescens_, _Fraxinus spp._, _Populus spp._, _Salix spp._, _Alnus glutinosa_, _Carpinus orientalis_.

Biological and behavioural research of _T. destruens_ has taken place previously in areas where its density was high, through systematic surveys in the field. Moreover, the life-cycle of this insect has been observed in detail on samples of infested trunks taken from different heights of the trees and reared in the laboratory.

Periodical monitoring has also been carried out throughout the entire pine forests in order to verify the extent and intensity of infestations.

**Results**

The data gathered in the Tirrenic and Adriatic pine stands did not show any significant differences between the two areas with regard to the development of the two generations that _T. destruens_ completes each year, except that in the Northern Adriatic area primarily adults hibernate, and they do so in the shoots or in the stumps of the trees. In Tirrenic pinewoods pupae, larvae, adults and occasionally eggs can be observed at the same time. Adults remain in shoots or under bark from autumn to spring, and in some cases they were also observed reproducing.

In Central Italy, therefore, hibernation during different growth phases results in the oviposition of the first generation potentially spread over a long period of time (from February to May). However, most hibernating adults start their reproductive activity in April and May, attacking branches and boughs of vigorous plants which do not appear to be stressed. On pines broken off and on those that have just been cut down during normal silvicultural practices, we observed about 50 attacks for every metre of length on the entire trunk. In Northern Adriatic pinewoods, where adults hibernate, the oviposition of the first generation occurs over a much shorter period (between March and April). In spite of these differences, the adults of the first generation emerge at both sites at the beginning of the summer. This is indicated by the characteristic resin cones which appear on the shoots of vigorous plants. The resin cones demonstrate that adults have entered the shoots in order to attain reproductive maturity. This can be observed as early as July. In August, the infested shoots become reddish, an indication of both the presence and the intensity of the attack upon the crown of the plant by the adults of the first generation.

In August, the oviposition of the second generation also takes place. In the Adriatic pine stands oviposition is concluded before winter, while in the Tirrenic pinewoods it follows an irregular course. This is because the adults of the first generation remain in the shoots longer in order to reach sexual maturity. This delay is probably due to the high temperatures and the long drought periods which occur during the summer in Central Italy, and which influence the vegetative growth of the trees, thus slowing scolytid maturation.

In Adriatic pinewoods, _T. destruens_ is more common in back dune areas, where ground water level is high and salt water enters. This weakens the plants, enabling primary
attack by fungi, such as *Heterobasidion annosum* (Fr.) Bref. and *Phellinus* (*Fomes*) *pini* (Bref. ex Fr.) A. Ames (Nanni pers. obs., 1995). Similarly, the areas most attacked in Tirrenic pine stands are those where salt water infiltration occurs as a result of the lowering of the water-table, due to the intense drawing of fresh water which take place during the summer.

**Discussion**

The results that were obtained from the research have helped clarify several aspects of scolytid biology and the behaviour in Central and Northern Italian pinewoods. This information is very important for pest management in these biocoenosis, the stability of which is very low from a silvicultural point of view (Tiberi 1995).

Generally, for the purpose of forest protection, it is impossible to use all the technical means available, not only in order to avoid undesirable collateral effects in the biocoenosis, but also because there is no economic imperative in the short term.

Moreover, many forests, which were planted for a range of different reasons now fulfill mainly environmental, protective and recreational roles. In pest management, therefore, it is necessary to consider the potential benefits from action, which depends on the use and the ecological importance of the forests concerned, the constraints of forestry politics, and the expectation of the public. To draw up a rational intervention programme it is necessary to have considerable knowledge of the interactions between the various ecosystem components as well as of the nature of the problem itself. This would guarantee a wide range of choice amongst the various defences that could be undertaken (Covassi 1989, Tiberi 1996). However, that choice is difficult when the forest concerned has been severely destabilized and subject to xylophagous attack, as is the case with the pine stands which have been the object of this research. In these situations, there are many obstacles in the way of creating an adequate control of *T. destruens*, primarily because of the behaviour of this insect. The long periods spent under the bark or within the shoots make it vulnerable to control methods for only a short period of time. Therefore, control efforts must rely upon preventive measures, such as the quick elimination and removal of stressed trees, which are more susceptible to scolytid infestation. Another course of preventive action, is to prepare several pieces of bait-trunk to attract the reproducing adults. Obviously, this practice is effective only if it is repeated over a period of many years.

**Conclusions**

During the last few years the Adriatic and Tirrenic coastal pine stands have been subject to various forms of stress as a result of a variety of interacting factors. The most important among these have been drought, ground water fluctuations, the attacks of primary pest-insects (sucking and defoliating insects) and fungal infection.

This phenomenon of extreme disturbance of the ecological balance of the forest stand has increased the activity of biotic factors, referred to as “weakness agents”, and amongst these, *T. destruens* is the most prevalent. Attacks of *T. destruens* is, therefore, a symptom of a greater problem.

In the areas under investigation *T. destruens* is endemic and has undergone dangerous and sometimes catastrophic increases. Intense attacks have taken place in limited but
nevertheless wide areas, such as in the Alberese pine stands where, since 1988, some 200 mature trees have been felled each year, in addition to those young infested trees which are felled during the usual thinnings that are part of the standard working plan.

With regards to the coastal pinewoods of Central Italy, this investigation has confirmed that *T. destruens* develops two generations a year, with a considerable overlapping taking place of the different growth phases. This phenomenon also occurs during hibernation, when adults, pupae, larvae and sometimes eggs have all been observed at the same time. Clearly, this overlapping of different growth phases greatly complicates pest management.

References Cited


