EPPO Datasheet: *Megaplatypus mutatus*

Last updated: 2021-02-24

IDENTITY

Preferred name: *Megaplatypus mutatus*
Authority: (Chapuis)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Coleoptera: Curculionidae: Platypodinae
Other scientific names: *Platypus mutatus* Chapuis, *Platypus plicatus* Brèthes, *Platypus sulcatus* Chapuis
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EPPO Categorization: A2 list
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EPPO Code: PLTPMU

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Notes on taxonomy and nomenclature

Megaplatypus mutatus is an ambrosia beetle within the subfamily Platypodinae and represents a taxonomic entity.

HOSTS

Megaplatypus mutatus is a polyphagous pest of trees, and poplars (*Populus* spp.) are considered to be important hosts in both its native range (South America) and introduced range (Italy). As poplars originate from the Northern Hemisphere, it is not clear what are the native hosts in South America, but *M. mutatus* has been recorded there on a wide range of timber, fruit and ornamental trees, including: *Acacia*, *Acer*, *Ailanthus*, *Citrus*, *Eucalyptus*, *Fraxinus*, *Laurus*, *Ligustrum*, *Liquidambar*, *Magnolia*, *Malus*, *Melia*, *Platanus*, *Populus*, *Prunus*, *Pyrus*, *Quercus*, *Robinia*, *Salix*, *Tilia*, *Ulmus* (Etiennot *et al.*, 1998; Giménez & Etiennot, 2003); conifers (*Pinus*, *Taxodium*) are also attacked.

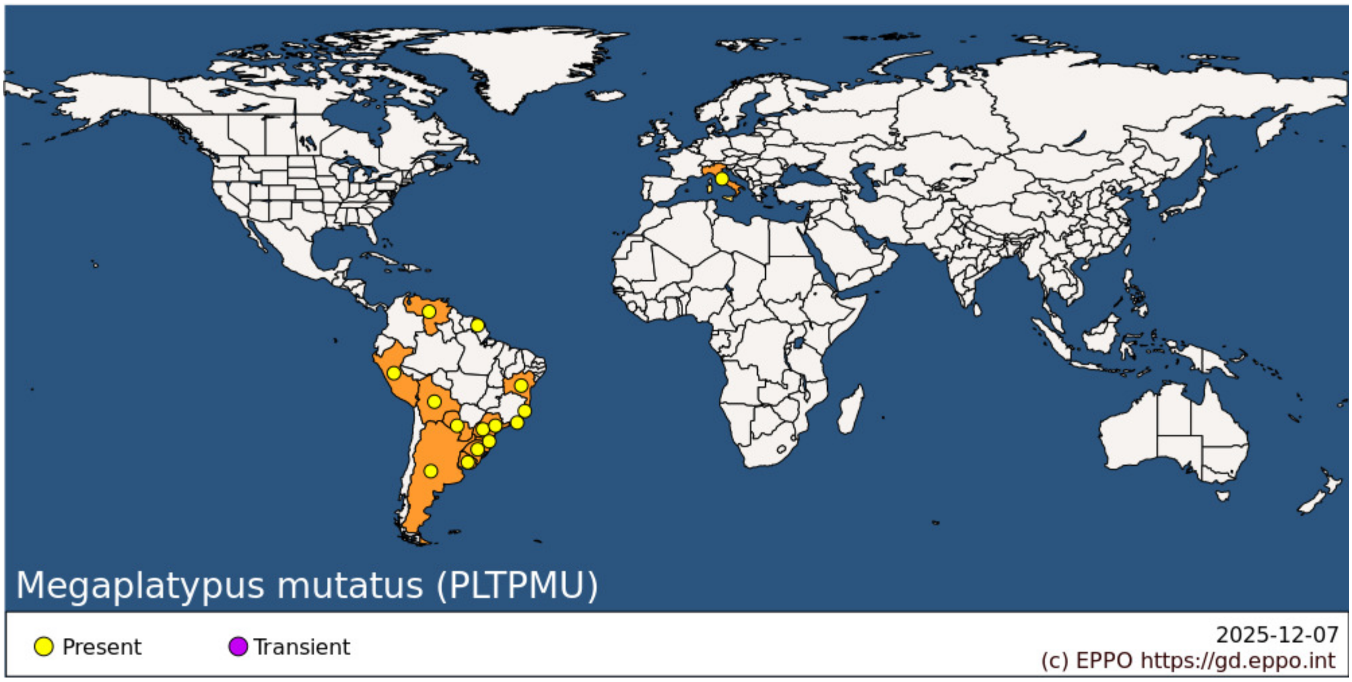
In Italy, *M. mutatus* was first recorded on *Populus* x *canadensis*, and then on fruit trees such as *Corylus avellana*, *Castanea sativa, Diospyros kaki*, *Ficus carica, Juglans regia, Malus, Morus, Prunus armeniaca*, *P. avium, P. persica, Pyrus,* as well as on *Eucalyptus, Quercus, Robinia* (Griffo *et al*., 2012).

Host list: *Acacia mearnsii*, *Acacia*, *Acer negundo*, *Ailanthus altissima*, *Araucaria angustifolia*, *Azadirachta indica*, *Balfourodendron riedelianum*, *Caesalpinia echinata*, *Calophyllum brasiliense*, *Cariniana estrellensis*, *Cariniana legalis*, *Castanea sativa*, *Casuarina cunninghamiana*, *Cedrela fissilis*, *Cenostigma pluviosum*, *Centrolobium tomentosum*, *Citrus*, *Corylus avellana*, *Croton floribundus*, *Croton piptocalyx*, *Delonix regia*, *Diospyros kaki*, *Enterolobium contortisiliquum*, *Erythrina crista-galli*, *Eucalyptus camaldulensis*, *Eucalyptus dunnii*, *Eucalyptus robusta*, *Eucalyptus tereticornis*, *Eucalyptus urophylla*, *Eucalyptus viminalis*, *Eucalyptus*, *Ficus benjamina*, *Ficus carica*, *Fraxinus excelsior*, *Fraxinus*, *Grevillea robusta*, *Juglans regia*, *Laurus nobilis*, *Ligustrum lucidum*, *Liquidambar styraciflua*, *Livistona chinensis*, *Luehea divaricata*, *Luetzelburgia guaissara*, *Machaerium stipitatum*, *Magnolia grandiflora*, *Malus domestica*, *Malus sylvestris*, *Malus*, *Mangifera indica*, *Morus*, *Pachira aquatica*, *Persea americana*, *Pinus*, *Piptadenia gonoacantha*, *Pittosporum undulatum*, *Platanus x hispanica*, *Platypodium elegans*, *Populus alba*, *Populus deltoides*, *Populus nigra*, *Populus x canadensis*, *Populus*, *Prunus armeniaca*, *Prunus avium*, *Prunus domestica*, *Prunus persica*, *Pyrus communis*, *Pyrus*, *Quercus palustris*, *Quercus robur*, *Quercus rubra*, *Quercus*, *Robinia pseudoacacia*, *Robinia*, *Salix alba*, *Salix babylonica*, *Salix nigra*, *Salix*, *Schizolobium parahyba*, *Sebastiania klotzschiana*, *Taxodium distichum*, *Tilia moltkei*, *Ulmus pumila*, *Ulmus*, *Vitex megapotamica*

GEOGRAPHICAL DISTRIBUTION

M. mutatus is native to subtropical and tropical regions of South America but has extended its distribution to colder areas of the continent, such as Patagonia (Southern Argentina) (Alfaro *et al*., 2007).

In 2000, the presence of *M. mutatus* was confirmed in Italy, where it caused severe damage to poplar plantations (*Populus* spp.) in the province of Caserta (Campania region) (Tremblay *et al*., 2000). According to Allegro and Griffo (2008) the beetle increased its distribution in Caserta from 130 km² in 2000 to 587 km² in 2007, and significant attacks were recorded in *C. avellana* (hazelnut) and *Diospyros kaki* (kaki) orchards. In subsequent years, *M. mutatus* spread to areas bordering Campania and reached Molise and Lazio regions in 2013 and 2016, respectively. There are no further confirmed findings in the EPPO region to date, although countries of the Mediterranean temperate belt (e.g. France, Greece, Spain, Turkey) which have poplar plantations and grow fruit crops, are anticipated to be at risk (Alfaro *et al.*, 2007).



EPPO Region: Italy (mainland)
South America: Argentina, Bolivia, Brazil (Bahia, Espirito Santo, Parana, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, Sao Paulo), French Guiana, Paraguay, Peru, Uruguay, Venezuela

BIOLOGY

Investigations into the population dynamics of *M. mutatus* have indicated a bivoltine life cycle in South America, as well as in Italy (Funes *et al*., 2011). It overwinters mainly as mature larvae or immature adults (Alfaro *et al*., 2007). Adults appear in the field in late spring-early summer (November–December in South America and May–June in Italy). Males start emerging a few days before females, and fly to tree trunks in which they bore a radial gallery directed towards the centre of the trunk, and attract females by releasing a specific pheromone (González Audino *et al*., 2005). After mating, the two adults bore new galleries inside the trunk, in which the female lays 100–200 eggs over a period of 2–3 months. Adults inoculate the galleries with symbiotic fungi which are specifically associated with the pest. An ascomycetous fungus *Raffaelea santoroi* was the first species to be identified in the galleries and frass of infested trees in Argentina (Guerrero, 1966). The fungus is not harmful to the tree, and simply grows saprophytically on the walls of the galleries, which become blackish as a result. The first and second instar larvae of *M. mutatus* are mycetophagous, feeding on the mycelium; as they grow larger, they become xylophagous, feeding on the wood directly. The mycobiota associated with *M. mutatus* has been further studied in Argentina. By analyzing numerous gallery fragments (1104 fragments from 28 poplar trees) and body parts of insects, Ceriani-Nakamurakare *et al*. (2016) identified 19 different fungal species. *Fusarium solani*, *Raffaelea* spp. and *Graphium basitruncatum* were the most abundant species, but *R. santoroi* was not found. Interestingly, one of these fungal associates, *Graphium basitruncatum*, was identified to be capable of producing components of the sex pheromone of *M. mutatus* (i.e. sulcatone), thus suggesting that fungi associated with *M. mutatus* play a role in the mating process (Slodowicz et al., 2019). The possibility that fungal communities present in *M. mutatus* galleries are specific to the host tree has been studied by comparing *Populus deltoides* and *Casuarina cunninghamiana*, but specificity could not be demonstrated (Ceriani-Nakamurakare *et al*., 2018).

Larvae generally reach maturity in early spring or within the 5 months before the cold season. They pupate in spring, and the adults emerge in late spring or early summer. Occasionally a few adults emerge before winter but, if a second generation is started, it is interrupted by cold (Santoro, 1963). There is still no evidence that *M. mutatus* has any distinct geographical races or ecotypes in South America.

DETECTION AND IDENTIFICATION

Symptoms

M. mutatus preferentially attacks large standing tree trunks (over 15 cm in diameter). The main sign of infestation is the presence of holes 3 mm wide, exuding sap and frass in early summer. The internal sinuous galleries are lined with the black mycelium of the symbiotic fungus.

Morphology

Eggs

Eggs are whitish and translucent, elliptical, about 1 mm long and 0.6 mm wide (Toscani, 1990).

Larva

The larval shape changes from elliptical (1st instar) to cylindrical (5th instar). The mature larva is about 7.2 mm long. The colour is brilliant white at 1st instar, becoming yellowish towards maturity (Santoro, 1965a).

Pupa

The pupa is 8–9 mm long, whitish in colour (Santoro, 1965a).

Adult

The adult has a cylindrical body with sulcate elytral striae. The head is as long as the pronotum. The male is about 7.5 mm long, dark brown above, clearer below; the female is 8–9 mm long, brown above and reddish-yellow below. Tarsi and antennae are reddish. In the male, the elytrae have truncate tips, with characteristic spiniform processes on the declivity; in the female, they have round tips, without processes. In both sexes, the anterior tibiae are rasp-like, helping the insect to move inside the galleries.

Detection and inspection methods

Visual inspection of the ambrosia beetle appears rather difficult, as it tends to spend most of its life hidden within the wood (FERA, 2014). The presence of galleries may also not sufficiently indicate whether active larvae are inside. However, frass may indicate insect activity. Two distinctive types of frass can be observed: one comprised of long particles, which results from digging activity of the adults; and a more granular sawdust from the feeding activity of the larvae (CABI, 2020). Specimens may be identified using the EPPO PM 7/129 Standard *DNA barcoding as an identi?cation tool for a number of regulated pests*, Appendix 1 on Barcoding of Arthropods (EPPO, 2016 – under revision). Referenced sequence material on the CO1 marker gene is accessible via EPPO-Q-bank.

The use of pheromone-baited traps was successfully applied in Campania (Italy) to assess the level of dispersion (Gonzales-Audino *et al*., 2013) and is recommended in plantations with anticipated infestations.

PATHWAYS FOR MOVEMENT

Locally, dispersal of *M. mutatus* is ensured by adult flying to new host trees, generally within a range of 50–100 m from the emergence hole. The adult is not a very good flyer, and is not likely to spread more than 100 m. After emergence, the adult has to find a new host within a maximum of 5 days (Santoro, 1963). Long-distance transport of the pest is possible in particular by commercial trade of wood (particularly large trunks), or on wood packaging material accompanying other traded articles. In Italy, it is hypothesized that *M. mutatus* was introduced with a single consignment of roundwood of poplar with bark, imported from Argentina. The pest is very likely to be carried by recently felled wood. *M. mutatus* could also be carried by plants for planting of its host trees, provided they were large enough to be attacked.

PEST SIGNIFICANCE

Economic impact

M. mutatus is mainly a pest of timber trees (especially poplar). It is a primary pest, as it attacks only live standing trees (Allegro, 1990). It does not attack declining trees or cut wood, and will only be present in them as a result of earlier primary attack. It drills the trunks and bores internal tunnels that weaken the trees, reducing yield (in wood volume) and causing breakage by wind, and even killing of trees which are highly stressed. The adult and larval galleries, by their presence and their dark fungal discoloration, disqualify the wood from the standards required by the plywood industry, thus dramatically lowering its value.

Fruit trees are also attacked by *M. mutatus*. They are weakened by the galleries, produce less fruit, and become liable to breakage by wind (Carella & Spigno, 2002). No significant environmental impacts have been documented, except some damage to trees planted as windbreaks.

There is no detailed information available on losses in South America, but it is reported that some poplar producers have lost their high quality wood market and have been obliged to diversify their activity to maintain their income, or else have lost income because of trading a lower quality product. There is similarly no detailed information on losses in Italy, but it is anticipated that growers will suffer from the decline in quality of their product, in view of the high-quality standards required by the wood industry.

Though *M. platypus* has not been reported outside its native range and Italy, Alfaro *et al*. (2007) considered it to be a severe threat to 'world poplar resources', mainly because the beetle has a broad geographical distribution in South America and a broad host range in all temperate regions of the globe where it occurs.

Control

M. mutatus is difficult to control, since most of its life cycle takes place within wood, and the adults, which are accessible to treatment during flight, are not very sensitive to insecticides. In Argentina, two approaches have been used. The first is early detection and destruction of infested trees (Santoro, 1967; Toscani, 1990), while the second is chemical control by injecting insecticides into the galleries or spraying trunks (Santoro, 1962, 1965b, 1967) during peak adult emergence in spring (Santoro, 1963). However, such chemical treatments are costly and potentially harmful to the environment and can only be carried out in high-value agricultural crops and in restricted areas. They are not advisable in woodlands.

The sex pheromones of the male of *M. mutatus* have been identified (González Audino *et al.*, 2005) and further development of traps was pursued. Gonzales-Audino *et al*. (2013) successfully caught *M. mutatus* in *Populus*, *Corylus*, *Juglans*, *Prunus* and *Eucalyptus* plantations (in which the pest was already suspected to be present) in Italy by the use of pheromone baited traps. Traps contained a (+)-sulcatol, sulcatone and 3-pentanol combination and were hung from trees with ropes at approximately 1.5 m above ground level. The traps caught a high proportion of females (92%), which confirmed its behaviour as a true sex pheromone. The same sex pheromones were successfully applied to disrupt and hence control mating behaviour of *M. mutatus* during trials conducted both in Argentina and Italy. In addition, it was further demonstrated, that these control measures could also reduce damage in hazelnut and poplar plantations (Funes *et al*., 2011). Though biological control would be a desirable strategy, no natural enemies of eggs or larvae of *M. mutatus* are known at present. In conclusion, the use of sex-pheromone baited traps in mass trapping strategies or, at least, in monitoring population peaks could be a valuable help in the control of the pest.

Phytosanitary risk

The fact that *M. mutatus* has become established in Italy where it is already causing damage to poplar (reduction of wood quality) and to fruit and nut crops (*Diospyros*, *Malus*, *Corylus*), shows that this pest presents a definite phytosanitary risk for the EPPO region. Indeed, tree mortality has been noted in *Corylus.* As it is likely that *M. mutatus* has been introduced without its natural enemies, it may thus have a greater economic impact in its introduced area than in its native range.

However, up till now, the fact that *M. mutatus* still has a limited distribution in Italy and that no further dispersal within the EPPO region has been documented, suggests a slow rate of natural dispersal. Although there is little likelihood of eradication, containment remains possible.

The endangered area extends widely in the EPPO region, because of the presence of numerous host plants for this polyphagous pest, and because climatic conditions are suitable over many parts of the region. A CLIMEX study, though having a high degree of uncertainty, indicated that the Mediterranean coasts are most likely to be at risk, extending to Portugal. Considering that the species may have a lower degree day per generation requirement than expected, the endangered area could possibly be extended to Northern Italy (Po valley, where there is extensive production of poplar), coastal areas of Balkan and Black Sea countries (EPPO, 2007).

PHYTOSANITARY MEASURES

In 2007 *M. mutatus* was added to the EPPO A2 list and endangered EPPO member countries are thus recommended to regulate it as a quarantine pest. The main pathways for introduction are plants for planting of host plants with trunks of more than 15 cm diameter, round wood of host plants of more than 15 cm diameter, sawn wood and wood packaging material. Plants for planting should originate from a pest-free area or come from a pest-free place of production with a buffer zone of at least 200 m. Round wood or sawn wood should come from a pest-free area or pest-free place of production or have been treated by fumigation, heat treatment, kiln drying or chemical pressure impregnation (EPPO, 2007). Debarking of trunks does not eliminate the possibility that the pest may still be present, as *M. mutatus* bores deep galleries. Wood packaging should comply with ISPM 15 (FAO, 2019).

It should be noted that there are separate possibilities of introduction from South America, and from the infested area in Italy. In practice, the risk of further entry from South America is low, because there is practically no existing trade in host plants or wood from the countries concerned to the EPPO region. The risk of movement with wood packaging should be adequately covered by ISPM 15. Within the EPPO region, there is relatively little prospect of movement of the large plants for planting which would be capable of carrying the pest.

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Datasheet history

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EPPO (2009) *Megaplatypus mutatus*. Datasheets on pests recommended for regulation. *EPPO Bulletin* **39**(1), 55-58. https://doi.org/10.1111/j.1365-2338.2009.02237.x

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