Rapid assessment of the need for a detailed Pest Risk Analysis for

Megaplatypus mutatus

Disclaimer: This document provides a rapid assessment of the risks posed by the pest to the UK in order to assist Risk Managers decide on a response to a new or revised pest threat. It does not constitute a detailed Pest Risk Analysis (PRA) but includes advice on whether it would be helpful to develop such a PRA and, if so, whether the PRA area should be the UK or the EU and whether to use the UK or the EPPO PRA scheme.

STAGE 1: INITIATION

1. What is the name of the pest?

Megaplatypus mutatus (Chapuis), Coleoptera, Curculionidae: a pinhole borer or ambrosia beetle ('Grand forest borer', a translation from the Spanish, is not in frequent usage).

Synonyms: *Platypus sulcatus* Chapuis, *Platypus plicatus* Brèthes, *Platypus mutates* Chapuis

2. What is the pest's status in the EC Plant Health Directive (Council Directive 2000/29/EC[1]) and in the lists of EPPO[2]?

It is not listed in EC Plant Health Directive Annexes but was added to the EPPO A2 list of pests recommended for regulation in 2013.

3. What is the reason for the rapid assessment?

The UK Plant Health Risk Register identified the need for a UK PRA based on the PRA for the EPPO area (EPPO, 2007) taking into account recent information from the single outbreak in Campania, Italy.

STAGE 2: RISK ASSESSMENT

4. What is the pest's present geographical distribution?

Megaplatypus mutatus is native to South America (Table 1; Annex 1 - Fig. 1), where its impact is reported chiefly from Argentina (Annex 1 - Fig. 2). Outside South America, *M. mutatus* has been introduced in the Campania region of Italy, where it occurs in the provinces of Caserta and Napoli (Griffo *et al.*, 2012).

[1] http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000L0029_do_001.pdf
[2] http://www.eppo.org/QUARANTINE/quarantine.htm

Table 1. Global geographical distribution of *Megaplatypus mutatus*.

Continent	Country	Source
South America	Argentina	Schedl, 1972
	Bolivia	Schedl, 1972
	Brazil	Schedl, 1972
	Guyana	Schedl, 1972
	Paraguay	Schedl, 1972
	Peru	Schedl, 1972
	Uruguay	Schedl, 1972
	Venezuela	Schedl, 1972
Europe	Italy	Tremblay *et al*., 2000

5. Is the pest established or transient, or suspected to be established / transient in the UK? *(Include information on interceptions and outbreaks here).*

M. mutatus is not present or transient in the UK, neither has it been intercepted.

6. What are the pest's natural and experimental host plants; of these, which are of economic and / or environmental importance in the UK?

6.1 Natural and experimental hosts

M. mutatus attacks healthy, standing trees with trunks greater than 15 cm in diameter (*Populus* - Etiennot *et al.* 1998, other hosts - Allegro & Griffo, 2008). Newly emerged, adult male beetles fly to new hosts, where they tunnel into the xylem (wood) and attract a mate with pheromones. The adult beetles create further galleries that extend across the width of infested trunks. They inoculate the galleries with a symbiotic ambrosia fungus (see 14), upon which the early larval stages feed. Larvae complete their development feeding on the host wood and overwinter within the trunk as larvae or immature adults (EPPO, 2009).

M. mutatus has been recorded from a wide range of principally deciduous hosts in both its native and introduced ranges (Table 2). The natural hosts of *M. mutatus* in its native range are unknown. It is often difficult to distinguish breeding from non-breeding hosts in the literature, although all hosts may be injured. Non-breeding hosts sustain less structural damage because only the initial tunnels are made. In South America, pest damage and breeding is mainly reported from *Populus*, especially *P. deltoides,* which is non-native on that continent. In Italy, *M. mutatus* has only been confirmed breeding in *Corylus*, *Malus,* and *Populus,* of which the latter is also the main host (Anonymous, 2011).

Table 2. Hosts of *Megaplatypus mutatus* in its native (S. America, Alfaro *et al*., 2007) and introduced (Italy, Griffo *et al.*, 2012) ranges.

Host	S. America	Italy	Host	S. America	Italy
Acacia	Yes		*Magnolia*	Yes	
Acer	Yes		*Malus*	Yes	Yes
Ailanthus	Yes		*Melia*	Yes	
Balfourodendron	Yes		*Morus*		Yes
Castanea		Yes	*Persea*	Yes	
Callophylum	Yes		*Pinus*	Yes	
Casuarina	Yes		*Platanus*	Yes	
Cedrela	Yes		*Populus deltoides*	Yes	
Citrus	Yes		*P. x canadensis*		Yes
Corylus		Yes	*Prunus*	Yes	
Diospyros		Yes	*P.armeniaca*		Yes
Erythrina	Yes		*P.avium*		Yes
Eucalyptus	Yes	Yes	*P.persica*		Yes
Ficus		Yes	*Pyrus*	Yes	Yes
Fraxinus	Yes		*Quercus*	Yes	Yes
Grevillea	Yes		*Robinia*	Yes	Yes
Juglans		Yes	*Salix*	Yes	
Laurus	Yes		*Taxodium*	Yes	
Ligustrum	Yes		*Tilia*	Yes	
Liquidambar	Yes		*Ulmus*	Yes	

6.2 Hosts in the UK

Many of the recorded hosts are environmentally and / or economically important in the UK (Table 3). For hosts in ornamental or landscaping situations, they will have both commercial and amenity (i.e. social) value.

Orchard crops and coppice

The proportion of top fruit and nut orchard crops threatened by *M. mutatus* depends on the proportion of orchards with trunk diameters greater than 15 cm (Table 3). These show that the majority of cider apples, plum, cherry and nut crops - but only 25% of dessert apple and pear orchards - are potentially vulnerable to attack. *Populus* is widely grown as a windbreak. The susceptibility of hosts under traditional (*Castanea* and *Corylus)* and short rotation (*Salix* and *Populus*) coppice management is uncertain because attack on coppice stools is undocumented. Short rotation coppice of *Salix* or *Populus* covers 2,500 ha in the UK, but the amount of poplar – probably in a minority - is unknown (Defra 2013).

Plantation crops

Cultivars of *Populus*, the main host of *M. mutatus*, are grown commercially in plantations throughout the UK. There are 12,500 ha of *Populus* in woodland (0.5% of woodland cover in Britain) and 1.5 million individual trees outside woodland (1.2% of trees), although these figures include trees growing in the wider countryside as well as plantations (Forestry Commission 2003).

Hosts of environmental / conservation importance

Numerous hosts have a significant environmental value in the wider countryside due to their function in ecosystems (Table 3, e.g. *Fraxinus*, *Quercus*, *Ulmus*). Aspen (*P. tremula*) is

widespread in the UK. The rare, native tree, Black poplar (*Populus nigra* var. *betulifolia*), which is related to poplars used in commercial plantations, is of conservation importance because the population stands at about 10,000 specimens (Falk 2002).

Table 3. Hosts of *Megaplatypus mutatus* in the UK, showing their occurrence in environmental and / or economic contexts. Threat (orchards) shows % of crops susceptible to attack (M. Perry pers. comm. for England & Wales; Scottish orchard data for 222ha are undifferentiated (Scottish Government, 2014)).

Hosts	Environment	Economic	Threat (orchards)
Acer	Countryside	Ornamental	
Castanea	Countryside	Coppice	
Citrus		Ornamental (indoors)	
Corylus	Countryside	Orchard / Coppice	80% of 120 ha
Eucalyptus		Ornamental	
Fraxinus	Countryside	Ornamental	
Juglans		Orchard / Ornamental	Minimal area
Laurus		Ornamental	
Ligustrum		Ornamental	
Magnolia		Ornamental	
Malus	Countryside	Ornamental	
Malus		Orchard - Dessert apples	25% of 7,300 ha
Malus		Orchard – Cider apples	85% of 7,200 ha
Pinus	Countryside	Plantation / Ornamental	
Platanus		Ornamental	
Populus	Countryside	Plantation / Ornamental	
Prunus	Countryside	Orchard / Ornamental	65% of 840 ha
P.avium	Countryside	Orchard / Ornamental	70% of 600 ha
Pyrus	Countryside	Orchard / Ornamental	25% of 1,200 ha
Quercus	Countryside	Plantation / Ornamental	
Robinia		Ornamental	
Salix	Countryside	Coppice / Ornamental	
Tilia	Countryside	Ornamental	
Ulmus	Countryside	Ornamental	
	Environment		

7. If the pest needs a vector, is it present in the UK?

M. mutatus does not require a vector.

8. What are the pathways on which the pest is likely to move and how likely is the pest to enter the UK? (*By pathway*): (tick box) ✓

There are six potential pathways:

8.1 Host plants for planting

Any nursery growing and moving one of the hosts more than 15 cm in diameter, within an area occupied by *M. mutatus*, could act as a pathway. The risk of nurseries in South America moving large trees to Europe is considered very low (EPPO, 2007). Since 2000,

there have been no EU interceptions of wood-boring insects on hosts, intended for planting, from the South American range of *M. mutatus* (Europhyt, 2014). EPPO (2007) stated that there is no known movement of large fruit or ornamental host trees from the outbreak area in Italy. However, Italy does export large trees of many species, including fruit trees, to the UK.

8.2 Round wood of host plants

Round wood originating in an area occupied by *M. mutatus*, could act as a pathway. A single, trial consignment of poplar round wood from Argentina is believed to have introduced *M. mutatus* into Italy (EPPO, 2007). Levels of attack on *Populus deltoides* stands ranged from 4-40% in Argentina (Giménez *et al.,* 2004) and up to 30% in *Prunus* and *Diospyros* in Italy (Griffo *et al*., 2012). Thus *M. mutatus* would be relatively likely to occur in round wood consignments.

Non-coniferous round wood is imported into the UK from South America in small quantities, rising from 350m^3 to 1,700m^3 in the last five years (2007-11, FAOSTAT, 2014). However, there are no data on the identity or size of species involved. Since 2000, there have been just two EU interceptions of wood-boring insects on wood from the South American range of *M. mutatus* (Europhyt, 2014). Should *Populus* be imported from South America, current EU phytosanitary measures (de-barked or kiln-dried to less than 20% moisture content; Directive 2004/102/EC) may not prevent *M. mutatus* from being introduced alive.

Concerning EU trade, the UK has imported little *Populus* round wood in recent years (250m^3 in 2008, none thereafter; Eurostat, 2014) and there is no further information on its source or final use.

8.3 Sawn wood of host plants

Sawn wood poses a lower risk of acting as a pathway for *M. mutatus,* compared to round wood: its surface material is removed; it is likely to dry out more quickly, depending on its size; and it is likely to be stored in places more isolated from potential hosts (EPPO, 2007). The UK imports around 20,000m^3 of *Populus* sawn wood annually (2008-12, Eurostat, 2014), but there is no further information on its source or final use. Current EU phytosanitary measures are as for round wood (above).

8.4 Wood packaging material (WPM)

Wood-boring insects are moved in trade in wooden pallets, crates and dunnage (WPM). Compliance with IPSM 15 has reduced the likelihood that WPM acts as a pathway (Haack *et al*., 2014), but low numbers of ambrosia beetles continue to be intercepted by the EU in WPM from China (Europhyt, 2014). According to reports of interceptions of *M. mutatus* in WPM in Chile, no live individuals have been recorded (USDA, 2001). There have been seven EU interceptions, of wood-boring insects in WPM, from the South American range of *M. mutatus* in the last 15 years (Europhyt, 2014). None of these included ambrosia beetles (Platypodinae).

As ISPM 15 does not apply to WPM moving within the EU, then WPM, made from poplar in Italy, could pose a risk. However, there is no information on whether Italy is a source of such WPM.

8.5 Wood for biofuel

Wood can be imported as a biofuel in the forms of firewood (logs), wood chips, wood waste (e.g. kindling, sawdust), briquettes and pellets. Wood waste, briquettes and pellets are not viable pathways: wood waste tends to have been kiln-dried for its primary purpose and insects are killed by the manufacturing processes of briquettes and pellets (Forest Research 2013).

The import of non-coniferous wood chips (1,300 tonnes in 2012) is for specialist purposes such as food smoking or barbecues, which do not use poplar wood (Forest Research 2013). Although non-coniferous firewood is also imported into the UK (8,400 tonnes in 2012), none comes from South America or Italy (Forest Research 2013).

8.6 Natural spread

Natural spread is not currently a viable pathway for *M. mutatus* to enter the UK, as it only occurs in the Campania region of Italy. Adults disperse locally, in search of suitable host trees and mates, up to a few hundreds of metres per generation (EPPO 2009).

	Very unlikely	Unlikely	Moderately likely	Likely	Very likely
1. Host plants	✓	✓			
2. Round wood	✓	✓			
3. Sawn wood	✓				
4. WPM	✓	✓			
5. Wood biofuel	✓				
6. Natural spread	✓				

9. How likely is the pest to establish outdoors or under protection in the UK?

9.1 *M. mutatus* establishment outdoors

Suitable hosts for *M. mutatus* can be found throughout urban and rural areas in the UK, wherever ornamental and landscape planting, forestry and orchards occur. However, CLIMEX modelling based on the native range of *M. mutatus* indicates likely establishment, in Europe, only in coastal areas of the Mediterranean basin (EPPO, 2007). The summer temperatures at the southern limit of *M. mutatus*' native range (e.g. Neuquen, Argentina) are similar to those in the outbreak area (Campania - Naples, Italy); but considerably higher than temperatures experienced on the south coast of England (e.g. Southampton; see Fig. 3). The minimum winter temperatures in Neuquen are lower than those in the UK, so minimum temperature is unlikely to be a limiting factor for the UK.

There is uncertainty as to the minimum temperature budget *M. mutatus* requires to complete development. Under one scenario with a lower temperature budget (1,800 degree days, base 7°C), central Europe, including parts of France, could have a suitable climate for *M. mutatus* (EPPO, 2007). Recent pheromone trapping evidence from Argentina and Italy indicates that *M. mutatus* has early and late summer flight periods (Funes *et al.*, 2011, Gonzalez-Audino *et al.*, 2013). This indicates that two generations are possible in areas with hot summers. In the UK, however, a maximum of one generation might be completed in the warmest areas of southern England, particularly in hot summers.

A related element of uncertainty is whether *M. mutatus*' development is limited by the annual temperature budget. Xylophagous insects can have variable development times, over one or more years, depending on the climate (e.g. *Anoplophora chinensis*, Jan van der Gaag *et al*., 2008). Such species are not constrained to completing development within one season, because their larvae can overwinter in the host tree. It has not been shown whether *M. mutatus* larvae can achieve this.

In summary, it is very uncertain how far *M. mutatus* could expand its range in Europe, but it remains unlikely to moderately likely to establish outdoors in the UK.

9.2 *M. mutatus* establishment under protection

The risk of establishment under protection is negligible because, although some ornamental hosts, e.g. *Citrus,* are kept indoors, few will have trunks of sufficient diameter for *M. mutatus*.

Outdoors:	Very unlikely		Unlikely	✓	Moderately likely	✓	Likely		Very likely	
Under protection:	Very unlikely	✓	Unlikely		Moderately likely		Likely		Very likely	

10. How quickly could the pest spread in the UK?

10.1 Natural spread

If *M. mutatus* managed to establish small populations, they would be likely to spread at a slow to moderate pace. In early summer, adults disperse up to a few hundred metres where suitable hosts occur (EPPO, 2009), but their temperature threshold for flight is uncertain. In Campania, Italy, the area of the *M. mutatus'* outbreak increased by c. 450km^2 between 2000 and 2007 (according to its presence at the very coarse scale of administrative areas, Allegro & Griffo, 2008) and the boundaries of the outbreak shifted by an average of c. 5km per year between 2008 and 2012 (Griffo *et al*., 2012). Although the preferred forestry hosts, *Populus* cultivars, are not grown commonly in plantations in the UK (Forestry Commission, 2003), *Populus* occurs widely in woodland and landscaping. In addition, the large number of alternative hosts in the wider countryside and urban areas means that natural spread at a landscape scale would be possible.

10.2 Spread in trade

If *M. mutatus* established in the UK, it could be moved in host trees from infested areas and in consignments of round timber and firewood. Although the distinctive, 3mm entrance holes can be visible on infected hosts in early summer, these are not obvious on all host species (EPPO, 2009). Therefore early infestations could easily go undetected and allow infected material to be distributed elsewhere. There are, however, no other ambrosia beetles (Platypodinae) on *Populus* in the UK (DBIF, 2014), so there should be no confusion as to the beetle's identity.

Natural spread:	Very slowly		Slowly	✓	Moderate pace	✓	Quickly		Very quickly	
In trade:	Very slowly		Slowly	✓	Moderate pace	✓	Quickly		Very quickly	

11. What is the area endangered by the pest?

Should *M. mutatus* establish in the UK, those regions with commercial orchards or poplar plantations in southern and eastern England, would be at greatest risk. Ornamental hosts in urban areas, where temperatures are elevated, could also be attacked.

12. What is the pest's economic, environmental or social impact within its existing distribution?

M. mutatus is a wood-boring beetle that colonises healthy trees. Although *M. mutatus* has been recorded from many hosts, only a limited number suffer serious damage. In South America, particularly Argentina, *M. mutatus* is a serious pest of commercial poplar plantations in river valleys. Here, economic damage is caused when trees are killed by trunk breakage (after high winds) and by beetle galleries staining the timber. Levels of damage are uncertain, although producers are unable to sell affected timber for high value uses such as

plywood or veneers. Similar damage to poplar and walnut is reported in the outbreak area in Italy (Alfaro *et al*. 2007), as well as some damage to windbreaks (EPPO, 2009). In addition, *M. mutatus* has reduced fruit yields (apple and hazelnut) and killed trees (hazelnut) in Italy (EPPO, 2007). Levels of attack reach 30% in plum and persimmon trees, although the economic impact is not reported (Griffo *et al*., 2012).

Very small	Small	Medium	Large	Very large
		✓	✓	

13. What is the pest's potential to cause economic, environmental or social impacts in the UK?

Many of the recorded hosts, for which damage has been reported in Italy, are grown commercially in the UK (with 2011 orchard crop values in millions – Defra, 2013): poplar, apples - dessert (£44m) and cider; pears - dessert (£16m) and perry; cherries (£8m); plums (£12m), hazelnuts and walnut (either for timber or walnuts). Values for cider apples and perry pears are unavailable, although their combined, planted areas equate to around half that of dessert apples. Traditional orchards, which are also of conservation and cultural importance, will be at highest risk because they have tree trunks larger than 15 cm in diameter (see 6.2, Table 3).

Even if *M. mutatus* establishes small populations in the warmest areas of the UK, the cooler climate means that rates of damage are likely to be much lower than that reported in Italy. Poplars used for windbreaks and landscaping and fruit trees, both in orchards and private gardens, would be at greatest risk.

Ecosystem-wide impacts have not been reported in Italy in the c.15 years following *M. mutatus'* introduction. If *M. mutatus* was to establish in the core range of the rare, native Black poplar (Buckinghamshire), there could be an impact on this species in the UK since its population is small (c. 10,000 trees), relatively localised and genetically homogeneous (Falk, 2002).

Very small	Small	Medium	Large	Very large
	✓			

14. What is the pest's potential as a vector of plant pathogens?

M. mutatus is a vector of the symbiotic ambrosia fungus, *Raffaelea santoroi* Guerrero (EPPO, 2009). The fungus does not directly affect the health of the host, but it does cause economic damage by staining the timber.

STAGE 3: PEST RISK MANAGEMENT

15. What are the risk management options for the UK? *(Consider exclusion, eradication, containment, and non-statutory controls; under protection and / or outdoors).*

This section considers risk management for the most likely pathways of establishment – trade in *Populus* wood products and trees for planting.

15.1 Exclusion

Exclusion would be the most desirable risk management option for *M. mutatus*. If present in round or sawn wood, it would not be excluded by current EU phytosanitary measures for importing *Populus* from the American continent (de-barked or kiln-dried to less than 20% moisture content; Directive 2004/102/EC). Although ISPM 15 is considered an effective

means of excluding *M. mutatus* in WPM (EPPO 2007), there is recent evidence that ISPM 15 does not kill 100% of wood-boring insects (e.g. *Agrilus planipennis,* Goebel *et al*., 2010) or is not implemented effectively (Haack *et al*., 2014). In addition, WPM produced for trade within the EU does not need to comply with ISPM 15.

Therefore *Populus* wood products and trees for planting (of the recorded hosts of *M. mutatus*), imported to the UK, should come from areas known to be free from *M. mutatus*. Given uncertainty about the rate of spread, which could be 5 km per year, pest free areas should be defined with an appropriate buffer zone. As *M. mutatus* only attacks hosts more than 15 cm in diameter, then this size would also act as a threshold for phytosanitary measures.

M. mutatus is difficult to detect as it passes most of its life cycle within the host wood and the bore holes are not easily seen. Therefore visual inspection of wood products at the points of export or import would not be an effective means of exclusion.

15.2 Eradication and Containment

Surveillance and monitoring of the most susceptible hosts (e.g. poplar plantations, shelter belts and traditional fruit orchards) are feasible using pheromone trapping (Gonzalez-Audino *et al*. 2013), coupled with detecting signs of bore holes on trunks. As the spread of *M. mutatus* is moderate, infested hosts could be destroyed to contain an outbreak, as long as its boundary is closely monitored. In addition, pheromone trapping itself disrupts mating in *M. mutatus*, leading to reduced impact on hosts (Funes *et al.* 2011). An outbreak would be much more difficult to control if infested hosts were dispersed across urban areas and / or private gardens; this situation has not been experienced so far in Italy.

For high value hosts, such as certain ornamental specimens or species of conservation concern (e.g. Black poplar, *P. nigra*), injecting or spraying tree trunks with insecticides is one option. This was effective against *M. mutatus* in Argentina (EPPO 2009); however, no systemic insecticides are currently approved for this use in the UK (Ostojá-Starzewski & Baker, 2012). Also, due to possible non-target effects on wildlife, this approach may be unacceptable to conservationists and the wider public.

16. Summary and conclusion of rapid assessment.

(Highlight key uncertainties and topics that will require particular emphasis in a detailed PRA) General / overall summary and conclusion and then specific text on each part of assessment...

Megaplatypus mutatus is causing serious economic damage in part of its native range and in a limited outbreak area of southern Italy. It is predicted to establish in the Mediterranean basin but its potential to establish in temperate climates, including the UK, is much more limited. Poplar and several orchard trees attacked in Italy are widely grown in the UK. There is a low risk of economic damage should *M. mutatus* establish here. This rapid assessment shows:

Risk of entry is very unlikely to unlikely with host plants for planting (*Populus* or fruit trees – *Prunus, Malus, Pyrus, Corylus, Juglans*), with round wood (*Populus*) and in wood packaging materials; and very unlikely with sawn wood and by natural spread. Movement of large host trees into the UK from Italy remains a concern.

Risk of establishment is unlikely to moderately likely outdoors and very unlikely under protection. This is based on climatic modelling of the region at risk in Europe and comparison with the summer temperatures in Italy and at the southern limit to its distribution in Argentina. Uncertainty concerns the extent to which *M. mutatus* can extend its generation time under sub-optimal temperatures. There is also uncertainty over the rate of spread of *M. mutatus*, measured by direct observation of adult behaviour compared to monitoring of presence / absence in the outbreak area.

Economic impact is assessed as small with the highest risk being to fruit trees and *Populus* grown commercially and for amenity.

Endangered area is assumed to be confined to orchards and urban areas of southern England with the highest summer temperatures.

Risk management Tree boring beetles are difficult to eradicate because they spend most of their life cycle in the host. Exclusion would be the most effective way of managing risk and infested hosts would need to be destroyed in the event of an outbreak. Large host trees from Italy pose the highest risk of entry.

Uncertainty The climatic suitability of the UK is the principal uncertainty. The reliability of the climatic modelling undertaken by EPPO is affected by uncertainties concerning: (i) the minimum threshold of development, (ii) the number of degree days required to complete development, (iii) the ability of the species to take more than one year to complete its life cycle if the summer is not sufficiently hot and (iv) the southern limit to its distribution in Argentina.

17. Is there a need for a detailed PRA? If yes, select the PRA area (UK or EU) and the PRA scheme (UK or EPPO) to be used. *(for PH Risk Management Work stream to decide)*

No	✓	Yes		PRA area: UK or EU		PRA scheme: UK or EPPO	

18. Given the information assembled within the time scale required, is statutory action considered appropriate / justified?

Yes Statutory action		No Statutory action	

19. IMAGES OF PEST

	
Adult *Megaplatypus mutatus*, c.8mm length © G. Allegro, CRA- Istituto di Sperimentazione per la Pioppicoltura, Casale Monferrato (IT).	Damage on *Populus*. © R. Griffo, NPPO Campania region, Napoli (IT).

For a range of images, see:

https://www.eppo.int/QUARANTINE/insects/Megaplatypus_mutatus/PLTPMU_images.htm

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21. REFERENCES

Alfaro RJ, Humble LM, Gonzalez P, Villaverde R and Allegro G (2007) The threat of the ambrosia beetle *Megaplatypus mutatus* (Chapuis) (=*Platypus mutatus* Chapuis) to world poplar resources. Forestry 80: 471-479.

Allegro G & Griffo R (2008) I rischi di diffusione di *Megaplatypus mutatus*. L'Informatore Agrario 13: 73-76.

Anonymous (2011) Regione Campania – Assessorato Agricoltura: *Megaplatypus mutatus*. http://www.sito.regione.campania.it/agricoltura/difesa/platypus.htm (accessed on 14 04 2014).

DBIF – Database of British Insects and their Foodplants (2014). http://www.brc.ac.uk/dbif/homepage.aspx (accessed on 19 05 2014)

Defra (2013a) Area of Crops Grown For Bioenergy in England and the UK : 2008-2011. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/141626/defra-stats-foodfarm-landuselivestock-nonfoodcrops-latestrelease-130125.pdf (accessed 15 05 2014).

Defra (2013b) Basic Horticultural Statistics 2013. https://www.gov.uk/government/publications/basic-horticultural-statistics (accessed 23 04 2014).

EPPO (2007) Pest Risk Analysis for *Megaplatypus mutatus.* https://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm (accessed 15 04 2014).

Jan van der Gaag D, Ciampitti M, Cavagna B, Maspero M & Hérard F (2008) Pest Risk Analysis for *Anoplophora chinensis*. Plant Protection Service, Wageningen, The Netherlands. http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/documents/Anoplop.pdf (accessed 07 05 2014).

EPPO (2009) Data sheets on pests recommended for regulation – *Megaplatypus mutatus*. EPPO Bulletin 39: 55-58.

EUROPHYT database (2014) (Accessed 14 05 2014). http://ec.europa.eu/food/plant/plant_health_biosafety/europhyt/network_en.htm

Eurostat database (2014) (Accessed 01 05 2014). http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

Falk SJ (2002) Black poplar – Warwickshire, Coventry and Solihull Local Biodiversity Action Plan. www.warwickshire.gov.uk/biodiversity (accessed 30 04 2014).

Forest Research (2013) UK trade in woodfuel – an overview. FR report to FC Plant Health. http://www.forestry.gov.uk/pdf/woodfueltradereport.pdf/$file/woodfueltradereport.pdf

Forestry Commission (2003) National Inventory of Woodland and Trees – Great Britain. Forestry Commission, Edinburgh.

Funes H., Griffo R., Zerba E., González-Audino P. (2011) Mating disruption of the ambrosia beetle *Megaplatypus mutatus* in poplar and hazelnut plantations using reservoir systems for pheromones. Entomologia Experimentalis et applicata 139: 226-234.

Etiennot AE, Giménez RA, Bascialli ME (1998) [*Platypus sulcatus* Chapuis (Coleoptera: Platypodidae): distribution of the attack according to the Diameter at the Height of Chest (DAP) of *Populus deltoides* and efficiency evaluation of herbicides]. *I Simposio Argentino Canadiense de Protección Forestal*. Buenos Aires, Argentina.

Giménez RA, Etiennot AE, Frank R, Alvarez G (2004) Incidence of the damage of Platypus sulcatus Chapuis in the quality of Populus deltoides woods. FOREST 2004. Abstract book p. 84. Biosfera (Brazilian Inst. for the Environment). Brasilia, Brazil.

Giménez RA & Etiennot AE (2003) Host range of *Platypus mutatus*. Entomotropica 18: 89–94.

Goebel PC, Sabula A, Herms DA & Bumgardner MS (2010) Failure to phytosanitize ash firewood Infested with emerald ash borer in a small dry kiln Using ISPM-15 standards. Journal of Economic Entomology 103: 597-602.

Gonzalez-Audino P, Griffo R, Gatti P, Allegro G, Eduardo E (2013) Pheromone detection of the introduced forest pest Megaplatypus mutatus (=Platypus mutatus) (Chapuis) (Platypodinae, Curculionidae) in Italy. Agroforestry Systems 87, 109-115.

Griffo R, Pesapane G, Funes H, Gonzalez-Audino P, Germinara GS (2012) Diffusione e controllo di platipo in Campania. L'Informatore Agrario 31: 66-67.

Haack RA (2006) Exotic bark- and wood-boring Coleoptera in the United States: recent establishments and interceptions. Canadian Journal of Forest Research 36: 269-288.

Haack RA, Britton KO, Brockerhoff EG, Cavey JF, Garrett LJ, Kimberley M, Lowenstein F, Nuding A, Olson LJ, Turner J, Vasilaky KN (2014) Effectiveness of the international phytosanitary standard ISPM No. 15 on reducing wood borer infestation rates in wood packaging material entering the United States PLOS 1 http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0096611 (accessed 15 05 2014).

Heilman PE (1999) Planted forests: Poplars. *New forests* 17: 89-93. DOI: 10.1023/A:1006515204167

Ostojá-Starzewski JO & Baker RHA (2012) Red-necked Longhorn: *Aromia bungii*. Plant Pest Factsheet. FERA. Available online at: http://www.fera.defra.gov.uk/plants/publications/documents/factsheets/aromiaBungii.pdf

Schedl KE (1972) Monographie der Familie Platypodidae (Coleoptera). (Ed. Verlag Dr. W & Junk NV) Den Haag (NL).

Scottish Government (2014) Statistics for farmland use – horticulture. http://www.scotland.gov.uk/Topics/Statistics/Browse/Agriculture-Fisheries/agritopics/Horticulture (accessed 15 May 2014).

Tremblay E, Espinosa B, Mancini D, Caprio G (2000) Un coleottero proveniente dal Sudamerica minaccia i pioppi. L'informatore Agrario 48: 89–90.

USDA (2001) Pest risk assessment of the importation into the United States of unprocessed eucalyptus logs and chips from South America. General Technical Report FPL−GTR−124. http://www.fs.fed.us/foresthealth/publications/pest_risk_assmt_logs_chips_samerica.pdf

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Annex 1 - Figures

Fig. 1 Global distribution of *Megaplatypus mutatus* (from EPPO 2007).

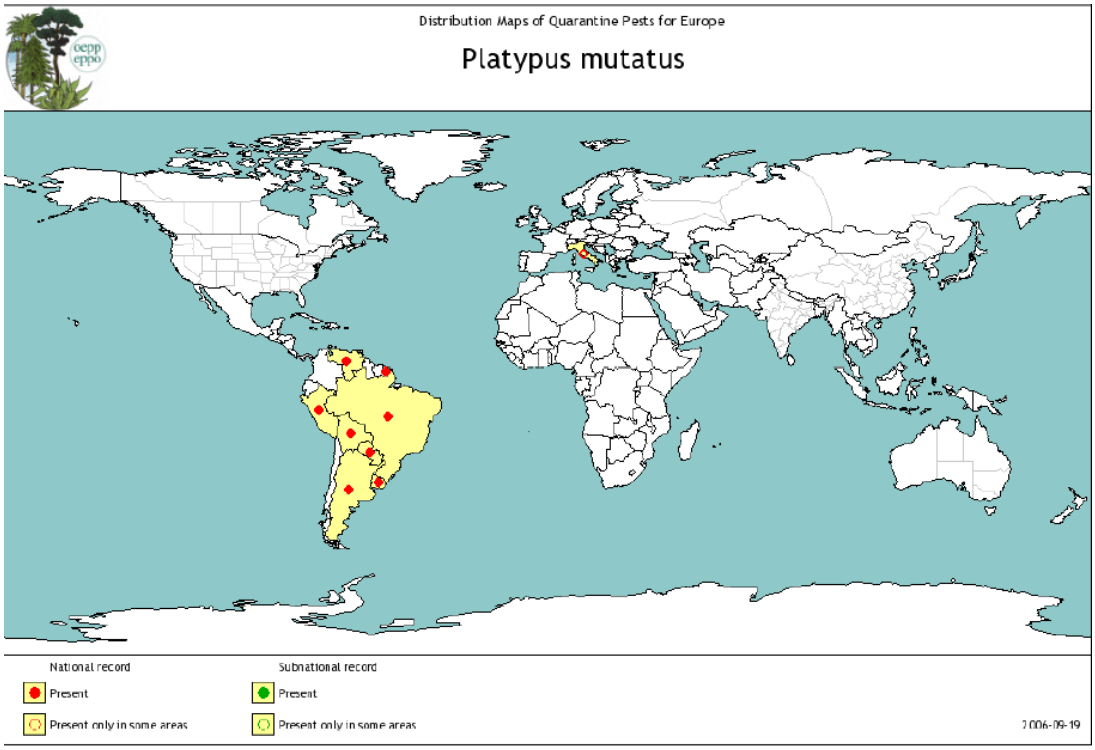

Fig. 2 Distribution of *Megaplatypus mutatus* in Argentina (from Giménez & Etiennot, 2003).

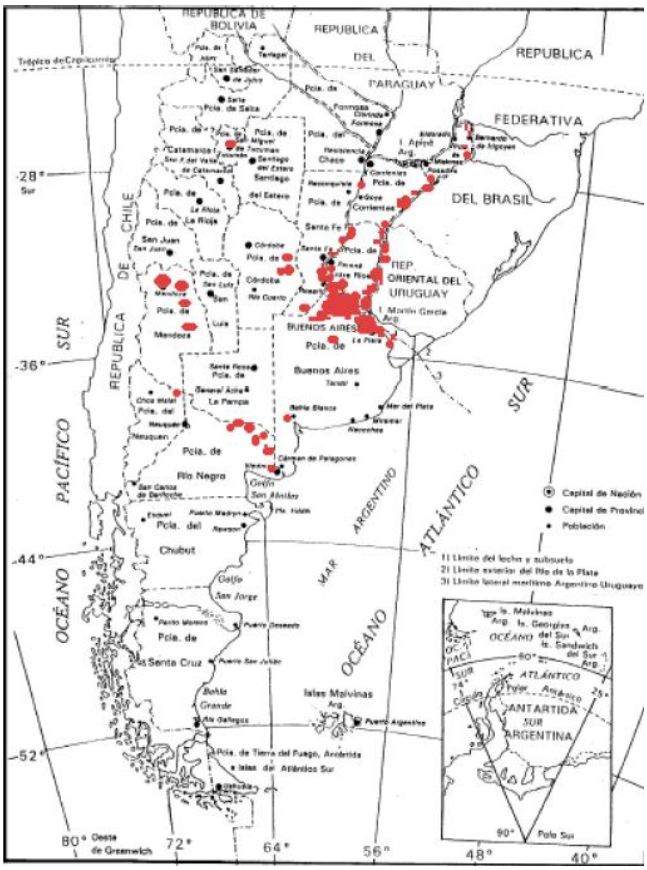

Fig. 3. Mean maximum and minimum monthly temperatures in Argentina (Neuquen and San Antonio Oeste), Italy (Naples) and the UK (Southampton). The positions of the temperature curves have been adjusted to allow a seasonal comparison between northern and southern hemispheres.