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SCIENTIFIC OPINION

Scientific Opinion on the pest categorisation of *Paysandisia archon* (Burmeister)[1]

EFSA Panel on Plant Health (PLH)[2, 3]

European Food Safety Authority (EFSA), Parma, Italy

ABSTRACT

The Panel on Plant Health performed a pest categorisation of *Paysandisia archon* for the European Union territory. *P. archon* is a well-defined pest species attacking many palm species. It is currently present in several southern European Member States (Croatia, Cyprus, France, Greece, Italy, Slovenia and Spain). Malta and Portugal are considered to be very important areas for further spread of the pest. The pest is listed in Annex IIAII of Council Directive 2000/29/EC and special requirements for host plants with respect to *P. archon* are formulated in Annexes IVAI and IVAII of Council Directive 2000/29/EC. This moth is a strong flier, but its main pathway of spread is via ornamental palms traded from outside the European Union and between Member States. Wherever its hosts are present outdoors in southern Europe, *P. archon* has the potential to establish. Although *P. archon* can complete its development in protected cultivation and in private/public indoor plant collections, there is no evidence of establishment. The damage produced by the larvae can cause the death of the plant with consequences for cultivated and native palm trees, and therefore on ecosystem services and biodiversity. At the moment no fully effective chemical or biological control methods are available against spread and impact of *P. archon*, while the use of glues on the stipe of the palm can be effective but affects the ornamental value of the plant. *P. archon* meets all pest categorisation criteria for both quarantine pests and regulated non-quarantine pests.

KEY WORDS

castniid palm borer, *Chamaerops humilis*, palm moth, *Phoenix theophrasti*, quarantine pest, regulated non-quarantine pest

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1 On request from the European Commission, Question No EFSA-Q-2014-00271, adopted on 2 July 2014.

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BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The current European Union plant health regime is established by Council Directive 2000/29/EC on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L 169, 10.7.2000, p. 1).

The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union, the list of harmful organisms whose introduction into or spread within the Union is prohibited and the control measures to be carried out at the outer border of the Union on arrival of plants and plant products.

The Commission is currently carrying out a revision of the regulatory status of organisms listed in the Annexes of Directive 2000/29/EC. This revision targets mainly organisms which are already locally present in the EU territory and that in many cases are regulated in the EU since a long time. Therefore it is considered to be appropriate to evaluate whether these organisms still deserve to remain regulated under Council Directive 2000/29/EC, or whether, if appropriate, they should be regulated in the context of the marketing of plant propagation material, or be deregulated. The revision of the regulatory status of these organisms is also in line with the outcome of the recent evaluation of the EU Plant Health Regime, which called for a modernisation of the system through more focus on prevention and better risk targeting (prioritisation).

In order to carry out this evaluation, a recent pest risk analysis is needed which takes into account the latest scientific and technical knowledge on these organisms, including data on their agronomic and environmental impact, as well as their present distribution in the EU territory. In this context, EFSA has already been asked to prepare risk assessments for some organisms listed in Annex IIAII. The current request concerns 23 additional organisms listed in Annex II, Part A, Section II as well as five organisms listed in Annex I, Part A, Section I, one listed in Annex I, Part A, Section II and nine organisms listed in Annex II, Part A, Section I of Council Directive 2000/29/EC. The organisms in question are the following:

Organisms listed in Annex II, Part A, Section II:

- *Ditylenchus destructor* Thome
- *Circulifer haematoceps*
- *Circulifer tenellus*
- *Helicoverpa armigera* (Hübner)
- *Radopholus similis* (Cobb) Thome (could be addressed together with the IIAI organism *Radopholus citrophilus* Huettel Dickson and Kaplan)
- *Paysandisia archon* (Burmeister)
- *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al.*
- *Erwinia amylovora* (Burr.) Winsl. *et al.* (also listed in Annex IIB)
- *Pseudomonas syringae* pv. *persicae* (Prunier *et al.*) Young *et al.*
- *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye
- *Xanthomonas campestris* pv. *pruni* (Smith) Dye
- *Xylophilus ampelinus* (Panagopoulos) Willems *et al.*
- *Ceratocystis fimbriata* f. sp. *platani* Walter (also listed in Annex IIB)
- *Cryphonectria parasitica* (Murrill) Barr (also listed in Annex IIB)
- *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili
- *Verticillium albo-atrum* Reinke and Berthold
- *Verticillium dahliae* Klebahn
- Beet leaf curl virus
- Citrus tristeza virus (European isolates) (also listed in Annex IIB)
- Grapevine flavescence dorée MLO (also listed in Annex IIB)
- Potato stolbur mycoplasma

- *Spiroplasma citri* Saglio *et al.*
- Tomato yellow leaf curl virus

Organisms listed in Annex I, Part A, Section I:
- *Rhagoletis cingulata* (Loew)
- *Rhagoletis ribicola* Doane
- Strawberry vein banding virus
- Strawberry latent C virus
- Elm phloem necrosis mycoplasm

Organisms listed in Annex I, Part A, Section II:
- *Spodoptera littoralis* (Boisd.)

Organisms listed in Annex II, Part A, Section I:
- *Aculops fuchsiae* Keifer
- *Aonidiella citrina* Coquillet
- Prunus necrotic ringspot virus
- Cherry leafroll virus
- *Radopholus citrophilus* Huettel Dickson and Kaplan (could be addressed together with IIAII organism *Radopholus similis* (Cobb) Thome
- *Scirtothrips dorsalis* Hendel
- *Atropellis* spp.
- *Eotetranychus lewisi* McGregor
- *Diaporthe vaccinii* Shaer.

TERMS OF REFERENCE AS PROVIDED BY THE EUROPEAN COMMISSION

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a pest risk assessment of *Ditylenchus destructor* Thome, *Circulifer haematoceps, Circulifer tenellus, Helicoverpa armigera* (Hübner), *Radopholus similis* (Cobb) Thome, *Paysandisia archon* (Burmeister), *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al*, *Erwinia amylovora* (Burr.) Winsl. *et al*, *Pseudomonas syringae pv. persicae* (Prunier *et al)* Young *et al. Xanthomonas campestris* pv. *phaseoli* (Smith) Dye, *Xanthomonas campestris* pv. *pruni* (Smith) Dye, *Xyîophilus ampelinus* (Panagopoulos) Willems *et al*, *Ceratocystis fimbriata* f. sp. *platani* Walter, *Cryphonectria parasitica* (Murrill) Barr, *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili, *Verticillium alboatrum* Reinke and Berthold, *Verticillium dahliae* Klebahn, Beet leaf curl virus, Citrus tristeza virus (European isolates), Grapevine flavescence dorée MLO, Potato stolbur mycoplasma, *Spiroplasma citri* Saglio *et al*, Tomato yellow leaf curl virus, *Rhagoletis cingulata* (Loew), *Rhagoletis ribicola* Doane, Strawberry vein banding virus, Strawberry latent C virus, Elm phloem necrosis mycoplasma, *Spodoptera littoralis* (Boisd.), *Aculops fuchsiae* Keifer, *Aonidiella citrina* Coquillet, Prunus necrotic ringspot virus, Cherry leafroll virus, *Radopholus citrophilus* Huettel Dickson and Kaplan (to address with the IIAII *Radopholus similis* (Cobb) Thome), *Scirtothrips dorsalis* Hendel, *Atropellis* spp., *Eotetranychus lewisi* McGregor *md Diaporthe vaccinii* Shaer., for the EU territory.

In line with the experience gained with the previous two batches of pest risk assessments of organisms listed in Annex II, Part A, Section II, requested to EFSA, and in order to further streamline the preparation of risk assessments for regulated pests, the work should be split in two stages, each with a specific output. EFSA is requested to prepare and deliver first a pest categorisation for each of these 38 regulated pests (step 1). Upon receipt and analysis of this output, the Commission will inform EFSA for which organisms it is necessary to complete the pest risk assessment, to identify risk reduction options and to provide an assessment of the effectiveness of current EU phytosanitary requirements (step 2). *Clavibacter michiganensis* spp. *michiganensis* (Smith) Davis *et al.* and *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye, from the second batch of risk assessment requests for Annex IIAII organisms requested to EFSA (ARES(2012)880155), could be used as pilot cases for this approach, given that the working group for the preparation of their pest risk assessments has been constituted and it is currently dealing with the step 1 "pest categorisation". This proposed modification of previous request would allow a rapid delivery by EFSA by May 2014 of the first two outputs for step 1 "pest categorisation", that could be used as pilot case for this request and obtain a prompt feedback on its fitness for purpose from the risk manager's point of view.

As indicated in previous requests of risk assessments for regulated pests, in order to target its level of detail to the needs of the risk manager, and thereby to rationalise the resources used for their preparation and to speed up their delivery, for the preparation of the pest categorisations EFSA is requested, in order to define the potential for establishment, spread and impact in the risk assessment area, to concentrate in particular on the analysis of the present distribution of the organism in comparison with the distribution of the main hosts and on the analysis of the observed impacts of the organism in the risk assessment area.

ASSESSMENT

1. Introduction

1.1. Purpose

This document presents a pest categorisation prepared by the EFSA Scientific Panel on Plant Health (PLH) (hereinafter referred to as the Panel) for the species *Paysandisia archon* (Burmeister) in response to a request from the European Commission (EC).

1.2. Scope

The pest categorisation area for *Paysandisia archon* is the territory of the European Union (hereinafter referred to as the EU) with 28 Member States (hereinafter referred to as MSs), restricted to the area of application of Council Directive 2000/29/EC, which excludes Ceuta and Melilla, the Canary Islands and the French overseas departments.

2. Methodology and data

2.1. Methodology

The Panel performed the pest categorisation for *P. archon* following guiding principles and steps presented in the EFSA guidance on the harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures (ISPM) No 11 (FAO, 2013) and ISPM No 21 (FAO, 2004).

In accordance with the harmonised framework for pest risk assessment (PRA) in the EU (EFSA PLH Panel, 2010), this work was initiated as a result of the review or revision of phytosanitary policies and priorities. As explained in the background of the EC request, the objective of this mandate is to provide updated scientific advice to European risk managers to take into consideration when evaluating whether those organisms listed in the annexes of Directive 2000/29/EC deserve to remain regulated under Council Directive 2000/29/EC, or whether they should be regulated in the context of the marketing of plant propagation material, or should be deregulated. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a quarantine pest in accordance with ISPM 11 (FAO, 2013) but also for a regulated non-quarantine pest in accordance with ISPM 21 (FAO, 2004) and includes additional information required as per the specific terms of reference received by the EC. In addition, for each conclusion, the Panel provides a short description of its associated uncertainty.

The Table 1 below presents the ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria on which the Panel bases its conclusions. It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation[4]); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

[4] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31/1, 1.2.2002, p. 1–24.

Table 1: International Standards for Phytosanitary Measures ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria under evaluation

Pest categorisation criteria	ISPM 11 for being a potential quarantine pest	ISPM 21 for being a potential regulated non-quarantine pest (RNQP)
Identity of the pest	The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible.	The identity of the pest is clearly defined.
Presence or absence in the PRA area	The pest should be **absent from all or a defined part of the PRA area.**	The pest is **present** in the PRA area.
Regulatory status	If the pest is present but not widely distributed in the PRA area, it should be under official control or expected to be under official control in the near future.	The pest is under official control (or being considered for official control) in the PRA area with respect to the specified plants for planting.
Potential for establishment and spread in the PRA area	The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest and, where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area.	–
Association of the pest with the plants for planting and the effect on their intended use	–	Plants for planting are a pathway for introduction and spread of this pest.
Potential for consequences (including environmental consequences) in the PRA area	There should be clear indications that the pest is likely to have an unacceptable economic impact (including environmental impact) in the PRA area.	–
Indication of impact(s) of the pest on the intended use of the plants for planting	–	The pest may cause severe economic impact on the intended use of the plants for planting.
Conclusion	If it has been determined that the pest has the potential to be a quarantine pest, the PRA process should continue. If a pest does not fulfil all of the criteria for a quarantine pest, the PRA process for that pest may stop. In the absence of sufficient information, the uncertainties should be	If a pest does not fulfil all the criteria for an regulated non-quarantine pest, the PRA process may stop.

Pest categorisation criteria	ISPM 11 for being a potential quarantine pest	ISPM 21 for being a potential regulated non-quarantine pest (RNQP)
	identified and the PRA process should continue.	

In addition, in order to reply to the specific questions listed in the terms of reference, three issues are specifically discussed only for pests already present in the EU: the analysis of the present EU distribution of the organism in comparison with the EU distribution of the main hosts; the analysis of the observed impacts of the organism in the EU; and the pest control and cultural measures currently implemented in the EU.

The Panel will not indicate in its conclusions of the pest categorisation whether the pest risk assessment process should be continued, as it is clearly stated in the terms of reference that, at the end of the pest categorisation, the European Commission will indicate EFSA if further risk assessment work is required following its analysis of the Panel's scientific opinion.

2.2. Data

2.2.1. Literature search

A literature search on *P. archon* was conducted at the beginning of the mandate. The search was conducted for the synonyms of the scientific name of the pest together with the most frequently used common names on the ISI Web of Knowledge database, Google scholar and CAB Abstracts (see Appendix A). Further references and information were obtained from experts, from citations within the references and from grey literature. The datasheet on *P. archon* provided by the PERSEUS project was also used as a source of references.

2.2.2. Data collection

To complement the information concerning the current situation of the pest provided by the literature and online databases on pest distribution, damage and management, the PLH Panel sent a short questionnaire on the current situation at country level, based on the information available in the European and Mediterranean Plant Protection Organization (EPPO) Plant Quarantine Retrieval (PQR) system, to the National Plant Protection Organisation (NPPO) contacts of all the EU MSs. A summary of the pest status based on EPPO PQR and EU MS replies is presented in Table 1.

Information on the distribution of the main host plants was obtained from the Eurostat database, the CABI Crop Protection Compendium, FAOSTAT and the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species.

3. Pest categorisation

3.1. Identity and biology of *Paysandisia archon*

3.1.1. Taxonomy

The organism under assessment currently has the following valid scientific name:

Name: *Paysandisia archon* (Burmeister, 1880)

Synonyms (mentioned in earlier literature): *Castnia archon* Burmeister, 1879; *Castnia josepha* Oberthür, 1914

Taxonomic position: Insecta: Lepidoptera: Castniidae

Most applied common names: palm moth, castniid palm borer and palm borer moth (English), papillon du palmier (French), castnide delle palme (Italian), taladro or oruga perforadora de las palmeras (Spanish).

3.1.2. Biology of *Paysandisia archon*

In Europe, all stages of *P. archon* (eggs, larvae, pupae and adults) can be observed during summer. Adults can be observed from mid-May to October, depending on the area (e.g. in France they can be found from June to September, according to Drescher and Dufay, 2002), with greatest abundance during June and July (Sarto i Monteys and Aguilar, 2005). Males are territorial and powerful fliers. They fly during the hottest parts of the day, in the morning as well as in the afternoon (Montagud Alario, 2004), when it is sunny, usually over rather small areas, and return to the same perching place.

P. archon seems to have a butterfly-like reproductive behaviour, i.e. it is not female pheromone driven. This implies that sex recognition has a strong visual stimuli component, followed by male sex pheromone at close range (Sarto i Monteys et al., 2012; Sarto i Monteys, 2013). Delle Vedove et al. (2012) observed that 73 % of individuals become sexually mature three hours after emergence, and the peak of their sexual activity is between 11:00 and 15:00 hours.

After mating, females lay eggs singly or in small clusters within the fibres close to or within the crown of the palm, at the basis of the leaf on the stem or in the terminal bud. No concrete data regarding the number of eggs laid in the wild are available, but this is estimated to be around 140 based on observations on dissections of females (Sarto i Monteys and Aguilar, 2005). Depending on the temperature, eggs hatch after 12 to 21 days.

Immediately after hatching, the larva bores a gallery into the stem or the young leaves that are not yet unfolded at the stem apex (in the terminal bud). The first instar of *P. archon* is exophagous only for the short time it needs to bore into the palm, while all following larval stages are endophagous, creating galleries in different parts of the palms. Larvae are cannibalistic and territorial; they create false cocoons, probably to distract natural enemies, and produce a brown-reddish substance from the mouth that can be spat out very forcefully when threatened, as a defensive behaviour already observed from other Castniidae species (Sarto i Monteys and Aguilar, 2005).

The pest overwinters as larvae, and all nine larval stages can be found in the palms during winter. This means that older instars overwinter once, whereas younger instars will have to overwinter twice, so the pest can have a life cycle of one or two years (Montagud Alario, 2004). Cocoons with living pupae can be found from mid-March to mid-September. Early instar larvae can be found in the stipe, within the fruit of *Chamaerops humilis*, or within the leaf rachis (especially in *Phoenix canariensis* and *Washingtonia filifera*). In *Trachycarpus fortunei*, the first instar larvae can bore into the young, packed palm leaves. Feeding damage becomes very obvious later, as the leaf develops, opens and expands, showing a series of consecutive holes on a circular section. Large larvae are found only in the stipe. They bore deep into the very core of it, where the humidity is higher and the temperature more stable, and remain there. They pupate within a cocoon made from plant fibres.

The cocoon is always located on or near the surface of the stipe or leaf axil in a cavity at one end of the terminal larval gallery. Pupae need an average of 66 days in March to complete the metamorphosis, an average of 52.3 days in April and an average of 42.8 days in July. The pupa emerges from the cocoon by means of dorsal spines and the mobility of its abdomen. It protrudes about two-thirds from the cocoon when the adult emerges, the exuviae are anchored in the cocoon. The chrysalis often remains attached to the exit hole after the adult is emerged (Drescher and Dufay, 2002; Riolo et al., 2005; Sarto i Monteys and Aguilar, 2005).

P. archon larvae seem to be restricted to palm trees (Arecaceae) as host plants. Although they have a well-developed proboscis, the adults have never been seen feeding, either in the wild or in captivity (Miller, 1986; Drescher and Jaubert, 2003; Sarto i Monteys and Aguilar, 2005).

Literature on the biology of *P. archon* from the countries of origin is scarce, most probably since it is rarely a pest in its native range. This may be due to control by natural enemies.

3.1.3. Intraspecific diversity

Intraspecific diversity is not reported for this pest.

3.1.4. Detection and identification of *Paysandisia archon*

There is little information available regarding monitoring techniques for *P. archon*. The moth has, however, been included in general monitoring activities in Sicily and France (Chapin et al., 2002; Longo, 2006). These surveys where done by visual assessments of the palms for damage and/or the presence of insects.

The **eggs** are typical castniid eggs, fusiform, upright, resembling a rice grain, light cream or creamy pink when freshly laid, with six or seven longitudinal ridges. These have associated aeropyles along their length, with the micropyle at one end of the long axis. The size is 4.69 ± 0.37 mm long and 1.56 ± 0.11 mm wide (Drescher and Dufay, 2002; Sarto i Monteys et al., 2005; Sarto i Monteys and Aguilar, 2005).

For emergence, the larva gently splits the chorion along one of the ridges. Immediately after hatching, the **larva** is pink and less than 1 cm long. After the first moult, mobility diminishes notably, the larva becomes ivory white and earlier instars have a blackish dorsum due to the blackish longitudinal dorsal vessel that is visible from outside the body; later instars turn ivory white and the dorsal vessel is less visible. During growth, chaetotaxy changes and cuticular spinules appear and are retained throughout the subsequent larval stages. After emergence, the body length is 7.3 ± 2.2 mm, and when fully grown the larva may reach a body length of 9 cm and a width of 1.5 cm at mid-length.

P. archon has nine larval instars.

Directly after pupation, the **pupae** are pale yellowish and turn reddish-brown after about two days, when the pupal cuticle darkens and hardens, staying like this until emergence. The pupa has a length of about 5.5 cm (EPPO, 2011). Most of the abdominal segments are fitted dorsally with transversal rows of short spines pointing backwards. The cocoons are fusiform and stout with an average length of 5.8 cm (range: 5.2–7.4 cm). The inner walls are coated by a layer of silk and secretions. The outer walls are loosely covered by fragments of palm fibres, so that they are not easily seen (Sarto i Monteys and Aguilar, 2005).

The **adult** has a large wingspan of 6–12 cm, depending on the authors. It has olive-brown forewings; the hind wings are orange or red, with a wide transverse black band containing five or six white cells. Antennae are clubbed and have a typical apical hook. Females have a long, telescopic and chitinous ovipositor. They are usually larger than the males (Miller, 1986; Drescher and Dufay, 2002; Sarto i Monteys and Aguilar, 2005).

Adults are easily visible when flying, and cannot be confused with any European Lepidoptera species (Montagud Alario, 2004), but it is very difficult to detect other stages of the pest. The only sign of the larvae may be the presence of debris, such as sawdust, that can be found at the outermost part of the gallery (Drescher and Dufay, 2002).

In general, infestation with *P. archon* is easily detectable by visual inspection since the symptoms are very characteristic, as also shown by a series of pictures published by different authors (Drescher and Dufay, 2002; EPPO, 2011; Chapin et al., 2013; Sarto i Monteys, 2013). For example, the presence of the pest in Almeria was first detected by observation of symptoms of infestation, followed by destructive sampling of trees to confirm its presence (Tapia et al., 2010). A similar situation was also reported from Cyprus, where the debris surrounding the crown was indicative of attack by this species

(Vassiliou et al., 2009). Symptoms, signs of presence and characteristics of damage are described by Drescher and Dufay (2002), Riolo et al. (2004), Sarto i Monteys and Aguilar (2005) and CABI (2014).

Infestations with *P. archon* can be identified by: (1) the presence of sawdust derived from larval galleries on the palm crown and/or palm trunk; (2) the presence of perforated or nibbled leaves (non specific); (3) gallery holes (axial and transversal) in the stipe (visible when the palm stipe is cut) and leaf petioles; (4) abnormal development of axillary leaf buds; (5) deformation and abnormal twisting of palm stipes; (6) abnormal drying up of the palms, especially the core leaves; (7) pupal exuviae on the outside of the stipe; (8) the presence of adults; and (9) the presence of eggs in the palm fibres. Furthermore, characteristics of damage that are useful for detection on the different parts of the plant—though these could also be caused by other pests—are external and internal feeding on fruit, inflorescences and in the stipe, boring on growing points, abnormal colours of leaves, yellowed or dead leaves, dead palm heart, distortion, resetting, early senescence of the whole plant and plant dieback. However, *P. archon* can also be present inside a palm tree without apparent symptoms (Riolo et al., 2005).

Some other lepidopterans native to the Mediterranean region (*Ostrinia nubilalis* (Hübner, 1796) (Crambidae) and *Sesamia nonagrioides* (Lefèbvre, 1827) (Noctuidae), both stem-borers of *Zea mays* but occasionally boring into palm trees (*P. canariensis*, *T. fortunei*)) have been observed to produce perforations in leaves similar to those described for *P. archon*.

Techniques for monitoring this pest beyond visual assessment do not seem to have been explored at the time of writing and it is uncertain whether chemical communications, such as long-range pheromones, are important in its biology or could be exploited for monitoring and/or detection purposes (Sarto i Monteys and Aguilar, 2005; Sarto i Monteys et al., 2012).

Figure 1: Phases of the cycle of *Paysandisia archon* from left to right: eggs, larva, cocoon, adults (male above and female below). (Picture kindly provided by Jean-Benoît Peltier, INRA, France)

3.2. Current distribution of *Paysandisia archon*

3.2.1. Global distribution of *Paysandisia archon*

Paysandisia archon is indigenous to South America: north-western Argentina, Brazil (Rio Grande do Sul), Paraguay (Paraguayan Chaco) and western Uruguay (Miller, 1986; Lamas, 1995; Sarto i Monteys, 2002; González et al., 2013). In the area of origin the distribution of the palm-borer moth is mainly scattered in local populations with low abundance levels (Montagud Alario, 2004). In South America it feeds on natural growing palms, and is only occasionally reported as a pest (Montagud Alario, 2004; CABI, 2014). The palm-borer moth has recently been introduced to the EU.

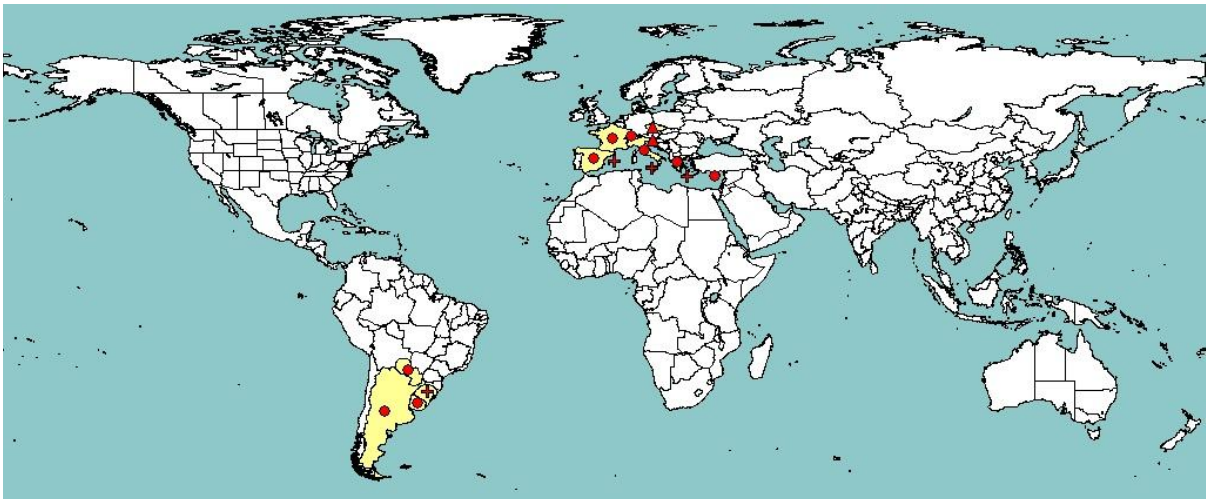

Figure 2: Global distribution of *Paysandisia archon* (extracted from EPPO PQR 2014, version 5.3.1, accessed 26 June 2014). Red circles represent pest presence as national records and red crosses show pest presence as sub-national records

3.2.2. Distribution in the EU of *Paysandisia archon*

Paysandisia archon was accidentally introduced to Europe probably as larvae hidden in *Butia yatay* and *Trithrinax campestris* plants imported from Argentina (Sarto i Monteys and Aguilar, 2005). The pest was introduced independently in different locations in Spain, France and Italy (Montagud Alario, 2004; Riolo et al., 2004; Sarto i Monteys and Aguilar, 2005; CABI, 2014). In Europe, where it is spreading rapidly, it is currently reported in Belgium, Bulgaria, Croatia, Cyprus, France, Greece (included Crete), Italy (included Sicily), Slovenia, Spain (included Balearic Islands) (Table 1). The species was also reported in the UK but has now been eradicated (Reid, 2008).

Table 2: The current distribution of *Paysandisia archon* in the risk assessment area, including Iceland and Norway, based on the answers received via email from the NPPOs

Country[(a)]	Current situation	Source
Austria	Absent, no pest records	Email from NPPO on 3 June 2014
Belgium	Transient, non-actionable: Three adults observed through citizen science at two locations (in 2011 and 2012).	Email from NPPO on 19 May 2014
Bulgaria	Transient, actionable, under eradication	Email from NPPO on 15 May 2014
Croatia	Present, only in some areas	Email from NPPO on 19 May 2014
Cyprus	Present, few occurrences	Email from NPPO on 9 May 2014
Czech Republic	Absent, pest eradicated	Email from NPPO on 26 May 2014
Denmark	One finding. Eradicated	Email from NPPO on 28 May 2014

Estonia	Absent, no pest records	Email from NPPO on 16 May 2014
Finland	Absent, no pest records	Email from NPPO on 12 May 2014
France	Reported in Languedoc-Roussillon and Paca regions. Officially established in the four coastal departments of Languedoc-Roussillon since August 2005.	André and Tixier Malicorne, 2013
Germany	Absent, no pest records	Email from NPPO on 4 June 2014
Greece	Present, first found in 2006 in Crete and Attica	Vassarmidaki et al., 2006
Hungary	Absent: no pest records	Email from NPPO on 2 June 2014
Iceland	—	
Ireland	Absent, no pest records	Email from NPPO on 2 July 2014
Italy	Reported in many Italian regions	Email from NPPO on 16 May 2014
Latvia	—	
Lithuania	—	
Luxembourg	—	
Malta	Absent: no pest records, confirmed by visual monitoring	Email from NPPO on 3 June 2014
Norway	—	
Poland	Absent: no pest records	Email from NPPO on 21 May 2014
Portugal	Absent	Email from NPPO on 20 May 2014
Romania	—	
Slovak Republic	Absent, no pest record	Email from NPPO on 16 May 2014
Slovenia	Present: only in one area (community Izola) on Palmae, confirmed by survey	Email from NPPO on 16 May 2014
Spain	Present in the Mediterranean zone and Madrid	Email from NPPO on 14 May 2014
Sweden	Absent, no pest record	Email from NPPO on 19 May 2014
The Netherlands	Absent, confirmed by survey	Email from NPPO on 24 April 2014
United Kingdom	Absent	Email from NPPO on 3 June 2014

(a) Note: the definition of “no pest records” has in some cases to be interpreted as “no pest surveys”

3.3. Regulatory status

3.3.1. Legislation addressing *Paysandisia archon* (Council Directive 2000/29/EC)

This species is a regulated harmful organism in the EU and listed in Council Directive 2000/29/EC in the following Section:

Annex II, Part A—Harmful organisms whose introduction into, and spread within, all Member States shall be banned if they are present on certain plants or plant products

Section II—Harmful organisms known to occur in the Community and relevant for the entire Community

(a) Insects, mites and nematodes, at all stages of their development

Species	**Subject of contamination**
10. *Paysandisia archon* (Burmeister)	Plants of Palmae, intended for planting, having a diameter of the stem at the base of over 5 cm and belonging to the following genera: *Brahea* Mart., *Butia* Becc., *Chamaerops* L., *Jubaea* Kunth, *Livistona* R. Br., *Phoenix* L., *Sabal* Adans., *Syagrus* Mart., *Trachycarpus* H. Wendl., *Trithrinax* Mart., *Washingtonia* Raf.

P. archon is listed as a quarantine pest in EPPO member countries (Albania, Algeria, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Guernsey, Hungary, Ireland, Israel, Italy, Jersey, Jordan, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey, UK, Ukraine and Uzbekistan).

3.3.2. Legislation addressing hosts of *Paysandisia archon* (Council Directive 2000/29/EC)

Annex IV, Part A—Special requirements which must be laid down by all Member States for the introduction and movement of plants, plant products and other objects into and within all Member States

Section I—Plants, plant products and other objects originating outside the Community

Plants, plant products and other objects	Special requirements
37.1. Plants of Palmae, intended for planting, having a diameter of the stem at the base of over 5 cm and belonging to the following genera: *Brahea* Mart., *Butia* Becc., *Chamaerops* L., *Jubaea* Kunth, *Livistona* R. Br., *Phoenix* L., *Sabal* Adans., *Syagrus* Mart., *Trachycarpus* H. Wendl., *Trithrinax* Mart., *Washingtonia* Raf.	Without prejudice to the prohibitions applicable to the plants listed in Annex III(A)(17) and the requirements listed in Annex IV(A)(I)(37) official statement that the plants: a) have been grown throughout their life in a country where *Paysandisia archon* (Burmeister) is not known to occur; or b) have been grown throughout their life in an area free from *Paysandisia archon* (Burmeister), established by the national plant protection organisation in accordance with relevant International Standards for Phytosanitary Measures; or c) have, during a period of at least two years prior to export, been grown in a place of production: — which is registered and supervised by the national plant protection organisation in the country of origin, and — where the plants were placed in a site with complete physical protection against the introduction of *Paysandisia archon* (Burmeister) or with application of appropriate preventive treatments, and — where, during three official inspections per year carried out at appropriate times, including immediately prior to export, no signs of *Paysandisia archon* (Burmeister) have been observed.

Section II—Plants, plant products and other objects originating in the Community

Plants, plant products and other objects	Special requirements
19.1. Plants of Palmae, intended for planting, having a diameter of the stem at the base of over 5 cm and belonging to the following genera: *Brahea* Mart., *Butia* Becc., *Chamaerops* L., *Jubaea* Kunth, *Livistona* R. Br., *Phoenix* L., *Sabal* Adans., *Syagrus* Mart., *Trachycarpus* H. Wendl., *Trithrinax* Mart., *Washingtonia* Raf.	Official statement that the plants: a) have been grown throughout their life in an area free from *Paysandisia archon* (Burmeister), established by the national plant protection organisation in accordance with relevant International Standards for Phytosanitary Measures; or b) have, during a period of at least two years prior to movement, been grown in a place of production: — which is registered and supervised by the responsible

	official body in the Member State of origin, and — where the plants were placed in a site with complete physical protection against the introduction of *Paysandisia archon* (Burmeister) or with application of appropriate preventive treatments, and — where, during three official inspections per year carried out at appropriate times, no signs of *Paysandisia archon* (Burmeister) have been observed.

Annex V, Part A—Plants, plant products and other objects which must be subject to a plant health inspection, originating in the community

I. Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community and which must be accompanied by a plant passport

> 2.3.1. Plants of Palmae, intended for planting, having a diameter of the stem at the base of over 5 cm and belonging to the following genera: *Brahea* Mart., *Butia* Becc., *Chamaerops* L., *Jubaea* Kunth, *Livistona* R. Br., *Phoenix* L., *Sabal* Adans., *Syagrus* Mart., *Trachycarpus* H. Wendl., *Trithrinax* Mart., *Washingtonia* Raf.

Annex V, Part B—Plants, plant products and other objects which must be subject to a plant health inspection, originating outside the EU

I. Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community

> 1. Plants, intended for planting, other than seeds […].

Owing to compatibility of hosts, the emergency measures currently in place to prevent the introduction and spread of *Rhynchophorus ferrugineus* (Commission Decision 2007/365/EC[5]) should also be considered. The need for specific inspections, import requirements, conditions of movement, creation of demarcated areas for many palm species (i.e. *Areca catechu*, *Arenga pinnata*, *Borassus flabellifer*, *Calamus merillii*, *Caryota maxima*, *Caryota cumingii*, *Cocos nucifera*, *Corypha gebanga*, *Corypha elata*, *Elaeis guineensis*, *Livistona decipiens*, *Metroxylon sagu*, *Oreodoxa regia*, *Phoenix canariensis*, *Phoenix dactylifera*, *Phoenix theophrasti*, *Phoenix sylvestris*, *Sabal umbraculifera*, *Trachycarpus fortunei* and *Washingtonia* spp.) should limit further the likelihood for *P. anchor* to be introduced to MSs.

3.4. Elements to assess the potential for establishment and spread in the EU

3.4.1. Host range

P. archon has been observed only on members of the Arecaceae family, in particular on the genera: *Brahea*, *Butia*, *Chamaerops*, *Jubaea*, *Livistona*, *Phoenix*, *Sabal*, *Syagrus*, *Trachycarpus*, *Trithrinax* and *Washingtonia* (CABI, 2014; INRA, 2014). It expresses preferences between genera, probably as a result of the different attraction produced by the plant kairomones and by the physical characteristics of the host, for example the amount of fibres as a relevant aspect in the selection of the host. This pest is more attracted to *Trachycarpus* palms, which is richer in fibres than *Washingtonia* (Peltier, 2007).

In its native range the pest infests *Butia yatay*, *Trithrinax campestris* and *Syagrus romanzoffiana* in the ecosystems where these palm species occur.

[5] Commission Decision 2007/365/EC of 25 May 2007 on emergency measures to prevent the introduction into and the spread within the Community of *Rhynchophorus ferrugineus* (Olivier). Official Journal of the European Union L 139/24, 31.5.2007, p. 24–27.

3.4.2. EU distribution of main host plants

Several palm species are grown in protected cultivation in the northern part of the European and Mediterranean region, in the open field in nurseries and as amenity trees in the southern region. The majority of them are grown for ornamental purposes, although 700 ha of date palms were harvested in Spain in 2012 (FAOSTAT, 2014).

Only two palm species are native to the risk assessment area: *Chamaerops humilis* (part of the Mediterranean costs, see Figure 3) and *Phoenix theophrasti* (Crete). *Phoenix canariensis* is not considered native in the risk assessment area since it originates from the Canary Islands, which is outside the scope of this opinion (section 1.2). While attacks on *C. humilis* have been observed in Europe, it is not yet known whether this pest can affect *P. theophrasti* (Kenis et al., 2012).

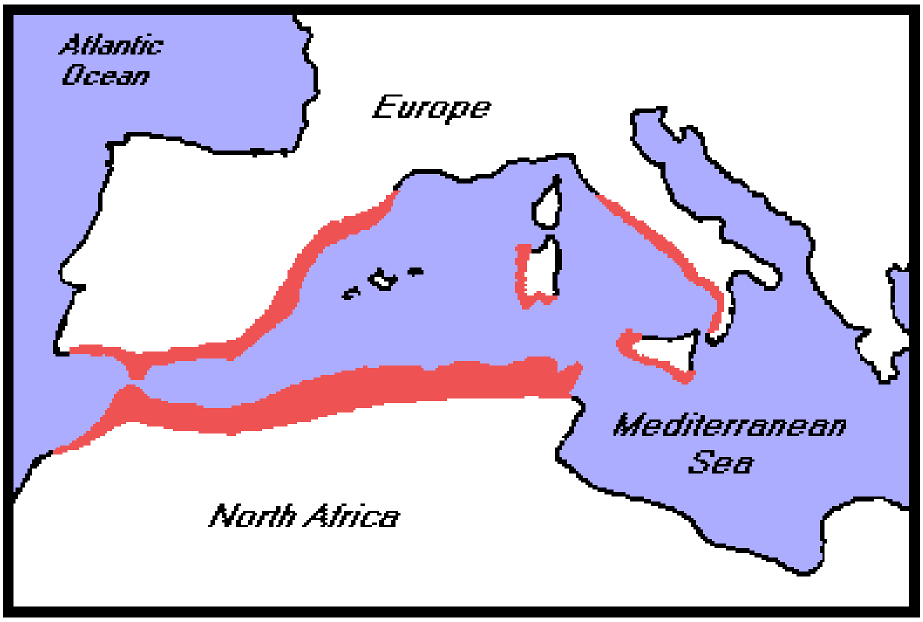

Figure 3: Distribution of *Chamaerops humilis* (1998–2006, Palm & Cycad Societies of Florida, Inc.)

3.4.3. Analysis of the potential distribution of *Paysandisia archon* in the EU

This pest is currently widespread in France, Italy and Spain. The endangered area is represented by the Mediterranean countries, Portugal, the Azores and Madeira. In these areas the palm trees are grown outdoors as crops or are present in the urban landscape and in forests. The climatic conditions characterising these areas in the EU comply with the preferred climate reported for the species: steppe climate (BS), warm temperate climate (wet all year, Cf), warm climate with dry summer (Cs) and warm temperate climate with dry winter (Cw) (CABI, 2014).

Suitable host plants and Koppen–Geiger climate zones in the area of current distribution are found in the following countries: Bulgaria, Croatia, Cyprus, France, Greece (including Crete), Italy, Malta, Portugal, Romania, Slovenia and Spain.

Information on the potential establishment of the pest in protected conditions (e.g. nurseries, botanic greenhouses, winter gardens) is not available yet: although the declared detections of the pest in northern EU countries are expected to have been conducted in protected conditions, the Panel could not retrieve evidence supporting this hypothesis. The only indication of survival in protected conditions is provided by Montagud Alario (2004), who describes the presence of *P. archon* in a butterfly house in the United Kingdom.

3.4.4. Spread capacity

P. archon can spread over large distances (i.e. long distance dispersal), mostly through the movement of infested planting material, mainly from Italy, France and Spain to other EU countries. This human assisted spread can often go undetected (Sarto i Monteys and Aguilar, 2001; Riolo et al., 2004). Plant parts liable to carry the pest in trade/transport are stems (above ground), shoots, trunks and branches (Sarto i Monteys and Aguilar, 2005). All the immature stages (eggs, larvae and pupae) can be carried in the plant material as they and their symptoms are usually invisible. Movement of infested planting material can also contribute to local dispersal. The adults have also the capacity to spread naturally: adults are in fact very powerful fliers, reaching 20 m/s (Peltier, 2007). CIRAD (unpublished data) registered for females a daily flight distance of minimum 6 m, mean 310 m and maximum 3 km. However, data at individual level do not enable a reliable estimation of the rate of dispersal to be derived based on the most common methods used in literature (Stevens et al., 2010). In addition, data on the spread rate at population level are lacking. For example, Montagud Alario (2004) describes how in France the first outbreaks observed in nurseries in June 2001 between Hyères and Toulon (ca. 20 km apart) spread rapidly to Hyères, Six Fours and Ollioules in a few weeks. However, this cannot be considered an estimate of the spread rate.

In 2000, the first European finding was registered in Spain: in Girona, Catalonia (Aguilar et al., 2001). In September 2001, flying adults were observed in an urban area of Barcelona province (Sarto i Monteys, 2002) and in June 2002 similar observations were made in Valencia province (Montagud Alario, 2004). Later, *P. archon* was detected on the Balearic Islands (EPPO, 2005, 2010a). In 2010, many adults were observed near the nature reserve of Cabo de Gata, Almeria, Andalusia (Tapia et al., 2010).

In Italy, after the first observation of three adults in Salerno, Campania region, in November 2002 (Espinosa et al., 2003), the pest was then reported in Ascoli Piceno, Marche region, in autumn 2003 (Riolo et al., 2004) and in Pistoia, Tuscany, in spring 2004 (ARPAT, 2004). The same year, *P. archon* was found in container plants of a nursery in Catania, Sicily (Colazza et al., 2005), and in a nursery in Apulia, while the first report of damage by *P. archon* outside nurseries in south Italy was provided by Porcelli et al. (2006) on observations conducted between 2005 and 2006 in Apulia. In 2005 it was also detected in the Lazio and Abruzzo regions (CABI, 2014) and from Lazio it travelled with palms for planting to Liguria region in June 2008 (Tinivella et al., 2010). Since 2007 it has been found in nurseries and ornamental flowerbeds in Emilia Romagna region (Bariselli and Vai, 2009), and in 2009 it was detected in nurseries in Veneto and Friuli-Venezia Giulia (EPPO, 2009, 2010b). Since then it has been observed in Lombardia in 2010, in Basilicata in 2011 and in a private garden in Cagliari, Sardinia, in March 2012 (Ciampi, 2012).

The trade of infested planting material between and within EU MSs, as well as natural spread, can be considered by far the most probable mechanisms for introduction of the pest into new areas of the EU.

It is also important to consider countries in North Africa and the Near East that are at risk because date palm (*Phoenix dactylifera*) and ornamental palms are important crops in these regions. Among the countries at risk are Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey. The risk for the EU could increase if the pest is able to reach some of these countries because of the importance of the import to the EU of palm trees from these countries.

3.5. Elements to assess the potential for consequences in the EU

3.5.1. Potential effects of *Paysandisia archon*

Once hatched, *P. archon* larvae bore towards the heart of the palm, damaging leaves, rachis and/or the top of the stem. The damage caused ranges from retarded growth to deformation of the crown and plant death, particularly in the presence of several larvae on the same tree or of small size trees or plants in the nursery or in containers (Drescher and Dufay, 2002; Soto Sánchez and Duart Clemente, 2009). In addition, the galleries produced by the larvae can facilitate secondary infections by pathogens (e.g. *Talaromyces erythromellis*, observed by Frigimelica et al., 2012). Owing to its large host range, it has the potential to find new hosts and cause heavy losses in areas where palms are grown outdoors.

3.5.2. Observed impact of *Paysandisia archon* in the EU

3.5.2.1. Impacts on cultivated plants

Serious damage has been observed in ornamental palm nurseries of southern Europe (Reid and Moran, 2009). However, the level of damage observed in the EU depends on the host species; for instance, *Washingtonia filifera* and *Washingtonia robusta* are rarely harmed (André and Tixier Malicorne, 2013).

In France, Italy and Spain, serious damage and plant mortality have been reported. For example, in the Marche region, Central-Eastern Italy, attacks by *P. archon* have been resulted in up to 90 % loss of production in ornamental palm nurseries (Riolo et al., 2004; Verdolini, 2013). In France this pest was the cause of destruction of, or severe damage to, 50 000–60 000 palm trees between 2002 and 2012 (André and Tixier Malicorne, 2013; Rochat, 2013). Furthermore, in Languedoc-Roussillon, an evident preference for *T. fortunei*, *C. humilis* and *P. canariensis* has been observed, and 80–90 % of *T. fortunei* plants, previously an abundant species in that region, disappeared between 2002 and 2012. In 2010 the city of Montpellier alone declared the loss of 80 % of *T. fortunei* plants owing to *P. archon* in about 10 years (André and Tixier Malicorne, 2013).

P. archon has also been found in other European countries; however, the infestation rate is still much lower and eradication was partly successful. Therefore, it can be expected that if the pest were to establish and spread effectively in other countries, the impacts would be similar to those observed in France, Italy and Spain.

In protected cultivations, infested plants might be severely damaged and, following detection, plants are destroyed.

3.5.2.2. Impacts on the environment

<u>*Impacts on biodiversity*</u>

Chamaerops humilis, which is the only autochthonous palm species in the Iberian Peninsula and Italy (and therefore of considerable ecological importance), is easily attacked by this pest (Soto Sánchez and Duart Clemente, 2009). Some stands of native *C. humilis* were found to be infested on the Balearic Islands in 2003 (Sarto i Monteys and Aguilar, 2005). This palm is a protected species in certain parts of its distribution area, e.g. Murcia (Merlo et al., 1993) and Comunidad Valenciana in Spain (Soto Sánchez and Duart Clemente, 2009) and Campania and Lazio regions in Italy (Di Domenico, 2013). It is one of the very few palm species whose area of origin is partially outside the tropics (reaching a northern latitude of 44° in France) (Cañizo, 2002). A curiosity is the existence of a specimen planted in 1585 and commonly known as the “Goethe palm” in the botanical garden of Padua. Since *C. humilis* has a shrub-like growth form, with several stems growing from a single base, it is more capable of surviving attack from *P. archon* than other species, e.g. *T. fortunei* (André and Tixier Malicorne, 2013).

<u>*Impacts on ecosystem services*</u>

Several ecosystem services are affected by *P. archon*. For example, ornamental resources are severely affected since *P. archon* represents a serious threat to many ornamental palms in Europe, with a devastating impact also on places of unique importance, such as the “Palmeral de Elche”, a plantation of palm trees in Alicante (Spain), which received World Heritage status in 2000. It is the largest palm grove in Europe and one of the largest in the world (Montagud Alario, 2004). The increase in the populations of *P. archon* changes the landscape aspect of the Mediterranean by killing the palms which are dominating these landscapes (André and Tixier Malicorne, 2013). Furthermore, by killing date palms (*P. dactylifera*), food resources are affected, although the only European date-producing country is Spain, which produces very small quantities (Liu, 2003). The fruits of *C. humilis* have traditionally been used in Algeria and Morocco (thus outside the risk assessment area) in medicine as an astringent because of their bitterness and high tannin content, so a reduction in this species also has an impact on the biochemicals and natural medicine ecosystem service. As *C. humilis* can be used to regenerate vegetation cover in arid areas, its reduction or disappearance can have negative impacts on the ecosystem services erosion regulation, soil formation and nutrient cycling. Furthermore, palm groves are one of the five classes of broadleaved evergreen forests classified among the European forest types (EEA, 2006). They are woods, often riparian, formed by palm trees of the Mediterranean and Macaronesian regions. Therefore, a dieback of these wild palms has an impact on water regulation and cycling as well as on climate regulation.

Indirect impacts on the environment have also been caused by the wrong chemical control methods put in place at the beginning of the invasion, when information on the most suitable control methods was not available, e.g. in France (André and Tixier Malicorne, 2013). An additional indirect impact is the effect of eradication, with removal of attacked palm trees.

3.6. Currently applied control methods in the EU

The most applied practice is the destruction of attacked plants: when adults are present (between 1 May and 30 October in France) the elimination of plants should be done as quickly as possible. Later on, and before the first adults emergence (beginning of April in France), it is less urgent. Elimination by chipping is preferable to incineration as it guarantees the destruction of any part of the plant on which even the smallest larvae could complete their cycle (Chapin et al., 2013).

In France many attacked palm trees have been replaced by *Washingtonia* species, which are less attractive to this pest. However, this cannot be considered a complete solution, as there is no evidence that the pest will not switch to other palm species, even if these are less attractive, when other species are not available, as already observed with *Phoenix canariensis* (André and Tixier Malicorne, 2013).

While it is well known that Castniidae species are controlled by many natural enemies in their original areas of distribution, in Europe there is insufficient knowledge about the natural enemies potentially able to control *P. archon*. Anecdotal observations have been obtained only from perforated eggs and eaten adults, suggesting parasitoid attacks and bird predation respectively (Chapin et al., 2013; Verdolini, 2013). Montagud Alario (2004) considers that classical biocontrol would be probably the only effective solution for controlling this pest.

Entomopathogenic agents, as nematodes of the genus *Steinernema*, have been studied for their use against *P. archon* by many European authors (Soto Sánchez, 2007; Ricci et al., 2009; Pérez et al., 2010, 2013; André et al., 2011). The positive results obtained make this option suitable for initial infestations and in well-defined application conditions (e.g. type of climate and selected product) (Chapin et al., 2013). The fungus *Beauveria bassiana* has shown effectiveness in preventative and curative applications (Besse-Millet et al., 2008, 2009; Gomez-Vidal et al., 2009). Chapin et al. (2013) provide a summary table of the non-target effects on entomopathogenic agents of active ingredients and other substances authorised for use on palm trees.

Physical methods such as protecting plants and/or areas of production by nets (preferably white in colour) are not very suitable for large plants (Chapin et al., 2013). The use of glues affecting both the penetration by young larvae and the flight by emerged adults guarantees a re-infestation rate below 10 % and a flying defect on 90 % of the emerging imagos (Peltier, 2013). On the other hand, the application of glues on the palm stipe seems to have the inconvenience of reducing the ornamental value of the plants (Chapin et al., 2013; Peltier, 2013).

The use of pheromones in mating disruption still needs further investigation (Delle Vedove et al., 2014).

Regarding the use of chemical control, trials on chemical treatments against *P. archon* are very limited. This is probably because it is rarely an important pest in South America and has only recently been found in Europe, unlike the red palm weevil, *Rhynchophorus ferrugineus* (Olivier) (Coleoptera: Curculionidae). The application of chemicals to *P. archon*, as for *R. ferrugineus*, is difficult because of the concealed nature of their larvae (Jacas and Dembilio, 2013). Jacas and Dembilio (2013) provide an overview of active substances, doses and application techniques authorised for use against *P. archon* in Spain. These authors stress that the use of pesticides has limitations in most of the areas where palm trees are located, such as public and private gardens, making the application integrated pest management (IPM) practices crucial in the control of this pest.

Frequent curative applications have not proved to be effective in reaching hiding larvae and cocoons (Sarto i Monteys and Aguilar, 2005; Nardi et al., 2009). Preventative applications and applications targeted to young larvae are the most effective. Comparative studies with different active substances applied either as powders or as soil treatments are provided by André et al. (2009).

André and Tixier Malicorne (2013) consider that its eradication in France is impossible.

3.7. Uncertainty

There is medium uncertainty in relation to where the pest will spread in future, the extent to which natural enemies could affect establishment and impacts, and the effectiveness of eradication. Furthermore, there is uncertainty about the presence of the pest in some of the EU MSs.

CONCLUSIONS

The Panel summarises in the tables below its conclusions on the key elements addressed in this scientific opinion in consideration of the pest categorisation criteria defined in ISPM 11 and ISPM 21 and of the additional questions formulated in the terms of reference.

Table 3: Panel's conclusions on the pest categorisation criteria defined in the International Standards for Phytosanitary Measures No 11 and No 21 and on the additional questions formulated in the terms of reference.

Criterion of pest categorisation	Panel's conclusions against ISPM 11 criterion Yes/No	Panel's conclusions against ISPM 21 criterion Yes/No	List of main uncertainties
Identity of the pest	*Is the identity of the pest clearly defined? Do clearly discriminative detection methods exist for the pest?* **Yes**, *Paysandisia archon* satisfies this criterion. It is a well-described insect species and its taxonomy is clear. Reliable detection and identification methods are available.		–
Absence/presence of the pest in the PRA area	*Is the pest absent from all or a defined part of the PRA area?* **Yes**, the pest present in all the endangered area.	*Is the pest present in the PRA area?* **Yes**, the pest is established in most of the southern EU MSs.	Missing information from certain MSs. Difficulty of detection. Effectiveness of eradication.
Regulatory	*Considering that the pest under scrutiny is already regulated, just mention in which annexes of 2000/29/EC and the marketing*		See section 3.3.

status	*directives the pest and associated hosts are listed without further analysis. (the risk manager will have to consider the relevance of the regulation against official control)* *P. archon* is listed in Annex IIAII of Council Directive 2000/29/EC. Special requirements for host plants with respect to *P. archon* are formulated in Annexes IVAI and IVAII. Host plants intended for planting must be subject to a plant health inspection before entry or before movement within the EU, according to Annexes VAI and VBI.		
Potential establishment and spread	*Does the PRA area have ecological conditions (including climate and those in protected conditions) suitable for the establishment and spread of the pest?* *And, where relevant, are host species (or near relatives), alternate hosts and vectors present in the PRA area?* **Yes**, *P. archon* satisfies this criterion: the pest has established and is spreading in the PRA area. Host species are available as wild plants and ornamental trees cultivated outdoors in the southern Europe and in protected conditions throughout the EU. Climate is suitable for establishment at least in the southern EU.	*Are plants for planting a pathway for introduction and spread of the pest?* **Yes**, this is the main pathway for *P. archon*.	Area of potential establishment.
Potential for consequences in the PRA area	*What are the potential for consequences in the PRA area?* *Provide a summary of impact in terms of yield and quality losses and environmental consequences* *P. archon* is considered a major pest for palms in the PRA area: effective control measures are not available yet and natural enemies have not been identified. The galleries produced by the larvae in the stipe and leaves weaken the plant and can kill the tree. Furthermore, they can facilitate secondary infections by pathogens. Impacts on ecosystem services	*If applicable, is there indication of impact(s) of the pest as a result of the intended use of the plants for planting?* **Yes**, the impact of this pest on palm trees for planting is very important.	No information is available on the potential effect of EU natural enemies in controlling *P. archon* (as in the area of origin this pest is controlled by them).

	and on biodiversity are also important.		
Conclusion on pest categorisation	The following criteria of a quarantine pest are fulfilled: • Consequences can be expected in areas of the EU where the pest is not yet present (endangered area: palm trees present). • It is present but not widely distributed in the EU; however, *P. archon* is already present in most of the countries that are at risk and may spread easily to suitable areas not yet infested. • There are several regulations for this pest, so it is officially controlled. Eradication is—at least in some MSs—no longer feasible.	The following criteria of a regulated non-quarantine pest are fulfilled: • The pest is present in the EU. • It is present in plants for planting. • It affects negatively and significantly the intended use of those plants. • It is regulated and controlled in the EU.	Overall uncertainty is limited.

Conclusion on specific ToR questions	*If the pest is already present in the EU, provide a brief summary of* – *the analysis of the present distribution of the organism in comparison with the distribution of the main hosts, and the distribution of hardiness/climate zones, indicating in particular if in the PRA area, the pest is absent from areas where host plants are present and where the ecological conditions (including climate and those in protected conditions) are suitable for its establishment,* – *the analysis of the observed impacts of the organism in the risk assessment area* *P. archon* is currently established in Italy, France and Spain, and present in Croatia, Cyprus, Greece and Slovenia. Based on to host availability and climate suitability, Malta and Portugal, where the pest has not been reported or not confirmed by the official survey, are other important areas for further spread. The observed impact in the risk assessment area is high and current control methods not sufficiently effective.	

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Appendix A. Literature search performed on *Paysandisia archon*

((Paysandisia OR Castnia) AND archon) OR (Castnia josepha) OR (palm moth) OR (castniid palm borer) OR (palm borer moth)

ISI Web of knowledge on 11 June 2014

= 607 results, first ones dating 1880

Between 2000 and 2014 = 205 results

ABBREVIATIONS

EFSA:	European Food Safety Authority
EPPO:	European and Mediterranean Plant Protection Organization
EPPO-PQR:	European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval System
EU:	European Union
ISPM:	International Standard for Phytosanitary Measures
MS(s):	Member State(s)
NPPO:	National Plant Protection Organisation
PLH Panel:	Plant Health Panel
RNQP:	Regulated Non Quarantine Pest