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Pest risk assessment made by France on *Erionota thrax* L. considered by France as harmful in French overseas departments of French Guiana, Guadeloupe, Martinique and Réunion - Scientific Opinion of the Panel on Plant Health

R. Baker, D. Caffier, J.W. Choiseul, P. de Clercq, E. Dormannsne-Simon, B. Gerowitt, O.E. Karadjova, G. Lövei, A. Oude Lansink, David Makowski, et al.

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Pest risk assessment made by France on *Erionota thrax* L. considered by France as harmful in French overseas departments of French Guiana, Guadeloupe, Martinique and Réunion¹

Scientific Opinion of the Panel on Plant Health

(Question No EFSA-Q-2006-096)

Adopted on 12 March 2008

PANEL MEMBERS

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SUMMARY

Following a request from the European Commission, the Panel on Plant Health was asked to deliver a scientific opinion on 30 pest risk assessments made by France on organisms which are considered by France as harmful in four French overseas departments, i.e. French Guiana, Guadeloupe, Martinique and Réunion. In particular, the Panel was asked whether these organisms can be considered as harmful organisms for the endangered area of the above departments, in the meaning of the definition mentioned in Article 2.1.(e) of Directive 2000/29/EC and thus potentially eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

This document presents the opinion of the Panel on Plant Health on the simplified² pest risk assessment conducted by France on *Erionota thrax* L. with French Guiana, Guadeloupe, Martinique and Réunion considered as endangered area.

Erionota thrax (L.) (Insecta: Lepidoptera: Hesperiiidae), the palm redeye, banana skipper or banana leafroller, is a pest of bananas, *Musa textilis*, and some other Zingiberales. Larvae feed on leaves of cultivated and wild banana plants. In its native areas, the defoliation of banana plants is usually very low, but in non-native areas it can be serious during outbreaks and favourable weather conditions. Complete defoliation has been reported sporadically.

The Panel examined the risk assessment in detail, and considered the accuracy and quality of the information provided and methods applied for pest risk assessment purposes. It came to the conclusion that the information material provided in the document could be considerably

¹ For citation purposes: Scientific Opinion of the Panel on Plant Health on a request from the European Commission on Pest risk assessment made by France on *Erionota thrax* L. considered by France as harmful in French overseas departments of French Guiana, Guadeloupe, Martinique and Réunion. *The EFSA Journal* (2008) 672, 1-23

² A simplified pest risk assessment contains in a “synthetic fiche” the information available allowing according to the risk assessor the assessment of the risk associated with the relevant organism (see the Terms of reference).

improved. The review was based on the principles of the International Standard on Phytosanitary Measures ISPM No. 11³: Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms (2004) by the International Plant Protection Convention (FAO, 2007b).

The Panel concluded that it is not possible to conduct a risk assessment on *E. thrax* alone because of uncertainties with its taxonomy and the general confusion in the literature about *Erionota* spp. The document is therefore, in effect, not a risk assessment just for *E. thrax* but also for three other closely related *Erionota* spp. (*E. torus*, *E. hiraca*, and *E. surprisa*). The judgements made by the Panel – if not specified otherwise – thus refer to all four of these closely related *Erionota* spp.

On this basis, the Panel, in general, accepts the conclusions in the French document. The Panel agrees that *Erionota* spp. have a low probability of entry for the French Guiana, Guadeloupe and Martinique due to the long distance from its current area of distribution and the existing phytosanitary legislation. However, the probability of *Erionota* spp. gaining entry to French Guiana, Guadeloupe and Martinique would be moderate if the current regulations governing imports of banana material were lifted. The probability of entry for Réunion is higher due to its proximity to Mauritius where *Erionota* spp. are present. The probability of *Erionota* spp. establishing in the PRA area⁴ after entry is high, since host plants are grown in the PRA area and the climatic conditions are similar to the areas where the 4 species currently occur.

The *Erionota* spp. can have severe impacts on banana in certain situations. However, the conclusion of the French document that the economic impact would be “extremely high” for Guadeloupe and Martinique and “fairly high” for French Guiana and Réunion cannot be supported by the Panel on the basis of the information provided in the pest risk assessment or from the information available in the scientific literature. Based on the information available, the Panel concludes that the impact of *Erionota* spp. would be low for French Guiana and Réunion and moderate for the Guadeloupe and Martinique. However, without additional information on the pest and the impacts it causes in Mauritius, the risk posed to Réunion and the other French overseas departments cannot be reliably clarified.

The Panel concludes that (a) the probability of entry is low for French Guiana, Guadeloupe and Martinique, and higher for Réunion, (b) the probability of establishment is high for all the French overseas departments, and (c) the potential for economic damage is low for French Guiana and Réunion and moderate for Guadeloupe and Martinique.

The Panel, based on the information provided in the document and on additional literature consulted, concludes that *E. thrax* and the three other closely related *Erionota* spp. are appropriate for evaluation of pest risk management options for the endangered areas of French Guiana, Guadeloupe, Martinique and Réunion and thus potentially eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

Key words: banana leafroller, banana skipper, *Erionota thrax*, French overseas departments, palm redeye, pest risk assessment, potential harmful organism.

³ ISPM International Standard for Phytosanitary Measures. ISPM No. 11: Pest risk analysis for quarantine pests, including analysis of environmental risks and living modified organisms.

⁴ PRA area is the area in relation to which a Pest Risk Analysis is conducted [FAO, 2007a].

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BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION⁵

The current Community 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 L169, 10.7.2000, p. 1), as last amended by Commission Directive 2006/35/EC (OJ L88, 25.3.2006, p. 9).

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 EC or moved within the EC, the list of harmful organisms whose introduction into or spread within the EC is prohibited and the control measures to be carried out at the outer border of the EC on arrival of plants and plant products. A harmful organism is defined in its Article 2.1.(e) as: any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products.

However, the provisions of the Directive are at present not yet applicable to trade in plants and plant products between the French overseas departments and the remainder of the Community. In view of the special nature of the agricultural production of the French overseas departments, additional protective measures justified on grounds of the protection of health and life of plants and plant products therein should be given.

France has therefore prepared for 4 departments (Guadeloupe, Guyana, Martinique and Réunion) 130 pest risk analyses (PRA) on organisms which are considered by France as harmful for the most important crops grown in these departments, such as banana, sugar cane, pine apple, rice, coffee, orchids, Palmae, etc. These PRAs cover a wide range of harmful organisms, such as insects and mites (54), fungi (14), bacteria (20) and virus (42).

In accordance with the discussions on this topic in the meeting of the Standing Committee on Plant Health on 27 and 28 April 2006, it was agreed that in a first phase France would select 30 PRAs among the 130 PRAs initially transmitted. They cover harmful organisms (insects, mites, fungi, bacteria and virus) affecting citrus fruit and bananas grown in the above departments.

Two types of PRA have been made: a full PRA for harmful organisms for which the probability of introduction into the French overseas departments is high with economic important crops and a simplified PRA for organisms for which the probability of introduction is extremely low.

The full PRAs have been made according to the Guidelines for the European and Mediterranean Plant Protection Organisation (EPPO) pest risk assessment scheme in EPPO Standard PM 5/3 (1) (EPPO Bulletin 27, 281-305). This scheme aims at assessing the potential risk of a particular pest (or harmful organism) for a clearly defined area through a quantitative evaluation of that risk based on questions to which replies are given on a 1-9 scale. Expert judgement is used in interpreting the replies. Moreover for each of the 130 harmful organisms a data sheet containing the most important data on the organism has been made according to the EPPO Standard PM 5/1 (1) on Checklist of information required for PRA (EPPO Bulletin 23, 191-198). The guidelines are based on many years experience of EPPO experts in the EPPO Panel on PRA and the EPPO Panel on phytosanitary measures. They conform with the International Standards on Phytosanitary Measures (ISPM) No 11 (Guidelines on PRA for quarantine pests) and use the terms of ISPM No 5 (Glossary of phytosanitary terms).

The simplified PRAs contain in a “synthetic fiche” the information available allowing the assessment of the risk associated with the relevant organism.

⁵ Submitted by the European Commission, ref. SANCO E/1/VE/svi D(2006)510488

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 scientific opinion on 30 PRAs made by France on organisms which are considered by France as harmful in 4 French overseas departments, i.e. Guadeloupe, French Guiana, Martinique and Réunion, and in particular whether these organisms can be considered as harmful organisms for the endangered area of the above departments in the meaning of the definition mentioned in Article 2.1.(e) of Directive 2000/29/EC and thus potentially eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

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ASSESSMENT

1. Introduction

This document presents the opinion of the Panel on Plant Health on the pest risk assessment conducted by France *Erionota thrax* L. with French Guiana, Guadeloupe, Martinique and Réunion considered as endangered area.

1.1. General introduction to *Erionota thrax*

Erionota thrax (L.) (Insecta: Lepidoptera: Hesperiiidae), the palm redeye, banana skipper or banana leafroller, is a pest of bananas, *Musa textilis*, and other Zingiberales (Ashari and Eveleens, 1974; Prasad and Singh, 1987; Waterhouse and Norris, 1989; Sands *et al.*, 1991; Gold *et al.*, 2002). The larvae feed on leaves of cultivated and wild banana plants. Serious defoliation has been observed during outbreaks and favourable weather conditions (Khoo *et al.*, 1991; Okolle *et al.*, 2006a; Okolle *et al.*, 2006b). *E. thrax* is also recorded from several other plants, including bamboo, coconut and several species of palms (Waterhouse and Norris, 1989). However, uncertainties on host plants and related impacts remain, because records on palms and bamboo may be inaccurate, as they may relate to other *Erionota* species (Waterhouse and Norris, 1989; de Jong, personal communication).

E. thrax originates from Southeast Asia. It was introduced to Mauritius, Guam, Saipan, Papua New Guinea and Hawaii (Evans, 1941; Waterhouse and Norris, 1989; de Jong and Treadaway, 1993; Kalshoven and van der Laan, 1981; Monty, 1970; Mau *et al.*, 1980).

Because of problems with taxonomy and the resulting confusion in the literature about *Erionota* spp., it is not possible for the Panel to consider the information given in the French document as only being relevant to *E. thrax*. In the literature, *E. thrax* remains confused with *E. torus* (feeding on *Musaceae*; CAB International, 2007), *E. hiraca* (formerly *E. acroleuca*; it feeds on *Elaeis guineensis*, Vane-Wright and de Jong, 2003 and other *Arecaceae*, Veenakumari *et al.*, 1997), and *E. surprisa* (e.g. de Jong and Treadaway, 1992, 1993; CAB International 2007, no information found on food plants). All these *Erionota* species originate from South Eastern Asia and their areas of distribution partly overlap. Therefore, judgements made by the Panel generally refer to these four closely related *Erionota* spp. if not specified otherwise.

1.2. The document under scrutiny

The assessment of risks of the organism is presented by the French risk assessors in a simplified pest risk assessment, which summarises the information available and provides a brief assessment of the risk. The simplified pest risk assessment follows the principal sections of ISPM No. 11 but also contains descriptive sections, e.g. geographical distribution, host plants and description of damage. The French risk assessment is based primarily on the information in the CABI Crop Protection Compendium (CAB International, 2001). Little additional information is included.

Based on this risk assessment, France has requested that *Erionota thrax* be added to the list of harmful organisms in Directive 2000/29/EC.

1.3. Evaluation procedure

The Panel examined in detail the documents provided, and considered the accuracy and quality of the information provided and methods applied for pest risk assessment purposes. The review was based on the principles of the International Standard on Phytosanitary Measures ISPM No. 11: Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms (2004) by the International Plant Protection Convention (FAO, 2007b).

The evaluation of the French document was conducted on the basis of an English translation from an original submission in French, which remains the reference language.

During the preparation of this opinion, the Panel has searched for and evaluated publications on *E. thrax* in the pertinent databases (CAB Abstracts, Google Scholar, Web of Science). More than 20 additional relevant publications were found. These papers contain additional information regarding the biology, impacts and control of the organism not provided in the pest risk assessment. Also, two experts have been contacted (Justin Okolle, School of Biological Sciences, Universiti Sains Malaysia, Minden, Penang, Malaysia, and Rienk de Jong, Nationaal Natuurhistorisch Museum, Leiden, The Netherlands).

1.4. General comments on the document

The document comprises 8 pages and includes 21 references (including two websites).

The document was compiled in 2003 and therefore new information was reviewed and updated where relevant to the risk assessment. Many issues have not been dealt with in detail, despite the availability of relevant information at the time of conducting the original assessment.

The Panel reviewed a translation of the original French document. In cases of doubt, concerning the accuracy of the translation the Panel has referred to the original French text.

The information provided in the document could be considerably improved. Important information is insufficiently provided or lacking or misplaced, and some of the information given is inaccurate, not substantiated by references or not supported by verifiable scientific data. This applies especially to: 1) the discussion of the difficulty of differentiating *E. thrax*, *E. torus* and other closely related species, 2) the possible introduction pathways, 3) potential host plants, 4) the situation in already infested areas (esp. Mauritius as it is close to part of the PRA area (Réunion)), 5) the potential economic impact of the pest organism in the PRA area and the potential amount of damage, and 6) the endangered area. Therefore, it has not been possible for the Panel to evaluate the accuracy of many of the estimates in the pest risk assessment. In addition, the degree of uncertainty is high, but this has not been adequately addressed in the French document.

2. Evaluation of the pest risk assessment

2.1. Pest categorization

2.1.1. Identity of pest

The French document does not adequately present the difficulties of identifying species within the genus *Erionota*, although information was available which documented these difficulties at the time the risk assessment was prepared (e.g. CAB International, 2001, de Jong and Treadaway, 1992, 1993). Although it is mentioned that there are two very similar, co-occurring species, *E. thrax* and *E. torus* (Evans 1941), which are principally separated by examining the male genitalia, it is not stated, that due to this difficulty, the literature on the biology,

distribution and pest status of *E. thrax* is likely to be unreliable because of confusion with *E. torus*. According to CAB International (2007), geographical records from China probably all relate to *E. torus* but the pest status of *E. torus* has not been confirmed, possibly due to confusion with *E. thrax*. The latest information on the distribution of *E. torus* is that it occurs in continental Southeast Asia, the Philippines, Taiwan, Okinawa, Saipan, Guam, Hainan, and the Hawaiian islands (Gu, 1997; Igarashi and Fukuda, 2000; de Jong, personal communication). CAB International (2007) only lists Taiwan.

A further source of confusion is the existence of another species, *Erionota hiraca* (Moore 1881), also described as *E. acroleuca* by Wood-Mason and de Niceville, which has a similar appearance and distribution to *E. thrax*. According to CAB International (2007) Piepers and Snellen (1910) and other authors have confused the two species, so it is not clear to which species their biological observations relate. It is also possible that the records of different host plants refer to other species or that there are host specific strains of *E. thrax* (Waterhouse and Norris, 1989). In the Philippines, de Jong and Treadaway (1992) discovered and described a fourth species, *E. surprisa*, which is very similar to *E. hiraca*.

In the French document, four subspecies of *Erionota thrax* are recognized: *E. thrax thrax*, *E. thrax mindana*, *E. thrax hasdrubal*, *E. thrax alexandra* (Evans, 1941; de Jong and Treadaway, 1993). No information on whether the different subspecies have different host preferences or whether they have the same host plants was found.

The Panel concluded that it is not possible to restrict the risk assessment just to *E. thrax* because of these taxonomic problems and the resulting confusion in the literature about species in the *Erionota* genus. The document should therefore be considered as a risk assessment for the four closely related *Erionota* species and the judgements made by the Panel – if not specified otherwise – are relevant to all four species.

In the literature, *E. thrax* has sometimes been misnamed as *Pelopidas thrax* (Hübner, 1821) (e.g. Mau *et al.*, 1980; Ito and Nakamori, 1986), which is a grass feeder occurring in Africa and from Turkey to Malaysia. It is a very different and much smaller hesperiid species, the larvae live on various grasses and it is not known to be a pest (CAB International, 2007). Also, *E. thrax* has been wrongly assigned to the genus *Hidari* (a mistake mentioned in Waterhouse and Norris, 1989).

2.1.2. Presence or absence in PRA area

Erionota spp. are not reported as present in the PRA area. However, in the Panel's view, the occurrence of this pest in Mauritius suggests some uncertainty about its absence in Réunion.

2.1.3. Regulatory status in PRA area

Erionota spp. are not currently listed as quarantine pests in the French overseas departments.

2.1.4. Potential for establishment and spread in PRA area

Considering the presence of suitable host plants in the PRA area and the current geographical distribution of the pest in areas with similar climates, the Panel agrees that *Erionota* spp. has a potential for establishment and spread in the French overseas departments under consideration.

2.1.5. Potential for economic consequences in PRA area

Susceptible banana cultivars are grown in the PRA area for export, local markets and household consumption, and thus the Panel agrees that *Erionota* spp have the potential for negative economic consequences in the PRA area.

2.1.6. Conclusion of pest categorization

The Panel concluded that it is not possible to restrict the risk assessment to *E. thrax* because of taxonomic confusion between *E. thrax* and three closely related species *E. torus*, *E. surprisa*, and *E. hiraca*. This results in confusion in the literature about species in the *Erionota* genus. The document is considered to represent a risk assessment for these four closely related *Erionota* species and the judgements made by the Panel – if not specified otherwise – are relevant to all four species, which have the potential for establishment and spread and for economic consequences in the PRA area.

2.2. Assessment of the probability of introduction and spread

2.2.1. Probability of entry of the pest

2.2.1.1. Identification of pathways

Four different pathways for *E. thrax* are mentioned in the French document: (1) young plants intended for planting carrying eggs (no plant species are specified); (2) bunches of banana where adults, particularly fertile females, may hide between the fruit, (3) leaf blades (no plant species are specified in the French document), formed into rolls by larvae within which they feed and grow, (4) *Arecaceae* (*Palmaceae*) carrying larvae or other stages (not specified).

However, no assessment is made with regard to the importance of the first two pathways.

The assessor comments later in the conclusion that both trade and the “passenger” pathway would be a significant pathway without a ban on at-risk families of plants. The Panel agrees generally that without this ban the trade or passenger pathway would be significant, and considers that this may currently be the most important potential pathway of introduction. This is especially relevant for passengers travelling from Mauritius to Réunion. According to Bertrand and Bornacina (2002) in 2001, around 1500 kg of plants, fruits and vegetables, including banana, were intercepted and destroyed at entry points in Martinique, illustrating the amount of illegally transported plant material.

However, no assessment is made. Despite the fact that bananas are produced in all the French overseas departments, import of banana fruits from other areas is a possible pathway. The amount of import would depend on factors such as the relative costs of production and transport, on the specific characteristics of the fruit and on the occurrence of climatic events which could temporarily limit local production in the French overseas departments (e.g. hurricanes).

These are cited from CAB International (2001). For the third pathway it is stated that the rolls formed from the leaf blade are easily spotted, but no judgement is made of the probability of introduction of larvae with banana or other plant leaves (e.g. leaves or young plants carried by individuals (passenger traffic), who may not spot the larvae or eggs). The Panel considers that banana leaves, sometimes used as wrapping material for diverse goods, for decoration or for handicraft objects could represent a pathway of entry.

For the fourth pathway the French document concludes that larvae would not be able to complete their life cycle on Arecaceae because the larvae need broad leaves for the leaf rolls in which they pupate (CAB International, 2001). However, the Panel considers that this conclusion is doubtful, as eggs and probably even small larvae may possibly be introduced on such host plant material. It should be clarified if they could complete their life cycle on banana plants after entry.

In total, the pathway analysis is not complete. It is not clear how *E. thrax* was introduced into Mauritius. According to Monty (1970), the irregular distribution of *E. thrax* and the lack of a well defined outbreak centre in Mauritius make it impossible to decide on the pathway. However, Waterhouse and Norris (1989) noted that adults are thought to have been introduced in military aircraft from Malaysia. There are some hints that a similar pathway was responsible for the introduction to Hawaii. According to Lai and Funasaki (1990) *E. thrax* was first discovered in Hawaii at Hickam Air Force Base on Oahu, where it infested backyard banana plants in the military housing areas. This information was available at the time the French risk assessment was conducted and should have been considered in the pathway analysis, as military aircraft could represent a pathway for *Erionota* spp.

2.2.1.2. Probability of the pest being associated with the pathway at origin

With regard to the limited distribution of the pest primarily in Asia and its presence in Mauritius, the Panel considers the probability of the pest being associated with the pathway at origin to be higher with regard to Réunion than with regard to the other French overseas departments. For Guadeloupe and Martinique and the trade and passenger pathway is especially relevant, if the ban on at-risk families of plants was lifted.

Probability of the pest being associated with the pathway at origin in detail according to the Panel's judgement:

- young plants intended for planting carrying eggs

No assessment is made in the French document with regard to the importance of this pathway. The Panel judges the probability as moderate to high for Réunion because of its proximity to Mauritius. For the other French overseas departments, the probability is assessed as low to moderate.

- bunches of banana with hidden fertile females

No assessment is made in the French document with regard to the importance of this pathway. The panel judges the probability as very low for the passenger pathway (it is very unlikely that passengers carry bunches of banana) and moderate for the trade pathway with regard to Réunion. Regarding the other French overseas departments, adult butterflies will most probably not survive transport and storage (see below).

- leaf blades

For the pathway "leaf blades" it is stated that the rolls formed from the leaf blade are easily spotted, but no judgement is made of the probability of introduction of larvae with banana or other plant leaves (e.g. leaves in a very early stage of infestation carried by individuals – passenger traffic – who may not spot the larvae or eggs). The Panel considers that banana leaves, sometimes used as wrapping material for diverse goods, for decoration or for handicraft objects could also represent a pathway of entry. Therefore, if current restrictions on the import of banana material into the French overseas departments are rescinded, banana leaves, especially leaves imported as wrapping material, for decoration, or handicraft could also pose a risk. The Panel judges that the probability would be low to moderate at an early stage of infestation but very low at late stages of infestation.

- *Arecaceae* (*Palmaceae*) carrying larvae or other stages

For the pathway “*Arecaceae*” the French document concludes that larvae would not be able to complete their life cycle on *Arecaceae* because the larvae need broad leaves for the leaf rolls in which they pupate (CAB International, 2001). However, the Panel notes high uncertainty for this pathway and considers that this conclusion is doubtful, as eggs and probably even small larvae may possibly be introduced on such host plant material. It should be clarified if they could complete their life cycle on banana plants after entry.

- natural spread

The French risk assessment concludes that the probability of natural entry (meaning natural spread from already infested areas) is fairly low for the Guadeloupe and Martinique. In contrast, the Panel judges this as extremely low due to the long distances from locations where the species occur. The probability for natural entry into Réunion is much higher since *E. thrax* is already present in the neighbouring island, Mauritius, which is only 160 km away. Since *E. thrax* has spread from Oahu to the other Hawaiian Islands flying over water for distances of up to 150 km (Waterhouse and Norris, 1989), it is suggested that natural spread between Mauritius and Réunion would be possible. However, although the pest was already introduced into Mauritius in 1970 or before (Monty, 1970), it has not yet been reported from Réunion. Therefore, the risk seems to be lower than estimated in the French risk assessment, which may be due to the fact that the density of *E. thrax* has been low on Mauritius since 1978. No estimation has been made in the French document of the probability of *Erionota* spp. entry into French Guiana.

- military aircraft low to moderate.

To clarify, if this could be a pathway for the French overseas departments, it should be verified, whether military aircraft are arriving from infested areas. Evidence is given because of the possible introduction into Mauritius and Hawaii by this pathway.

2.2.1.3. Probability of survival during transport or storage

Banana plant propagation material and fruit are usually transported and stored under cool conditions (18-20°C and 14°C, respectively) (Lassoudière, 2007). During long distance shipment, the adult moth is unlikely to survive and reproduce in the hold of ships carrying bananas which are kept at these temperatures under controlled atmospheric conditions since such continuous cool conditions do not occur in the current area of distribution. However, with regard to short distance transport between Mauritius and Réunion, survival of the pest during transport and storage may not be affected.

2.2.1.4. Probability of pest surviving existing pest management procedures

Currently, for all French overseas departments, the import of banana and other Zingiberales planting material (other *Musa* spp., *Strelitzia* spp., *Ensete* spp., *Heliconia* spp., *Orchidantha* spp., *Ravenala* spp. and hybrids) is prohibited from all origins, except under exceptional derogation for certified vitro-plant material and under quarantine in nurseries after introduction. Import to French Guiana, Guadeloupe and Martinique of fruit of banana and of other *Musaceae* is forbidden except when originating from Dominica, Guadeloupe and Martinique. Import to French Guiana, Guadeloupe and Martinique of fruit of banana and of other *Musaceae* is forbidden except when originating from Dominica, Guadeloupe and Martinique. Import of banana fruit to Réunion is prohibited except for green fruit free from all bacterial and fungal diseases under exceptional derogations (JORF 16/02/1992). If these current regulations were lifted, the movement of plant propagation material and fruit from areas

where *Erionota* spp. occur could represent potential pathways. This is underlined by the fact that *Erionota* spp. have been introduced into areas outside their origin, suggesting that the organisms have spread by human assistance related to transport of infested host plants. In the French risk assessment it is mentioned that, without a ban on at-risk families of plants (which are not explicitly named in the French document), the trade or passenger pathway would be significant.

The Panel considers that current practices of washing and treating fruits with disinfectants (Lassoudière, 2007) before export are expected to reduce the risk associated with the fruit pathway to a minimum.

2.2.1.5. Probability of transfer to a suitable host

Due to the widespread presence of host plants in the PRA area, the Panel considers that the probability of transfer of the pest to a suitable host is high on the conventional plant propagation material pathway, as this material will be planted in banana-growing areas or in private gardens.

In addition, the Panel considers that the pest could also be transferred from infected banana leaf material (wrapping, etc.) to a host, if this were discarded outdoors. The Panel concludes that the probability of transfer to a suitable host in the PRA area is “not likely” on the fruit pathway.

2.2.1.6. Conclusion on the probability of entry

The Panel concludes that *E. thrax* and closely related species have a low probability of entry into French Guiana, Guadeloupe and Martinique, due to long distances from infested areas and a low likelihood for suitable pathways because of existing regulation. However, the probability of entry would be moderate in the absence of the current regulations. For Réunion, the probability of entry is higher due to its proximity to Mauritius where *E. thrax* is already present.

The Panel concludes that because of a number of introductions into islands in the tropics (Evans, 1941; Monty, 1970; Kalshoven and van der Laan, 1981; Waterhouse and Norris, 1989; de Jong and Treadaway, 1993), pathways for *Erionota* spp. exist and entry into the PRA area is possible.

2.2.2. Probability of establishment

2.2.2.1. Availability of suitable hosts, alternate hosts and vectors in the PRA area

In 2006, dessert bananas were produced commercially on 7300 ha in Martinique (Agreste, 2007a) and 2240 ha in Guadeloupe (Agreste, 2007b). In the same year, in Réunion 500 ha were cultivated with bananas (Agreste, 2007c). Data from 2005 show 355 ha of bananas in French Guiana (INSEE, 2007).

Banana, plantain and cooking bananas are grown in family gardens in the French overseas départements for household consumption. The importance of this production is underpinned by food consumption data for Guadeloupe and Martinique (AFSSA, 2007). In 2006 family gardens occupy 1080 ha in Martinique (Agreste, 2007b), 615 ha in Guadeloupe (Agreste, 2007a) and 2890 ha in Réunion (Agreste, 2007c). In French Guiana, banana and plantain are among the associated crops of the shifting cultivation, which is practiced on 33 % of the total utilized agricultural area (PDR Guyane, 2007).

Heliconia spp. are present in all French overseas departments (Fournet, 2002; Cons. Bot. Nat. de Mascarin, 2007; Olliver and Marcon, 2007) and *Heliconia* hybrids are grown for cut flower production in Guadeloupe on 30 ha (Agreste, 2007b).

The list of host plants is incomplete and no references are given. Robinson *et al.* (2001) provide an extensive list of known host plants for *E. thrax* (not differentiated into subspecies), *E. torus* and *E. hiraca* (*acroleuca*) in Asia⁶. CAB International (2001 and subsequent years) and EPPO PQR (2002; 2006) list host plants of *E. thrax*, Mau and Kessing (1993) list in addition *Canna*, and *Strelitzia* for Hawaii. *Heliconia papuana* is an ornamental native species of Papua New Guinea and a widespread host for *E. thrax* there (Waterhouse *et al.*, 1998). According to CAB International (2007) wild palms have not been recorded as host plants. Okolle *et al.* (2006c) state that *E. thrax* has a very narrow host range. They identified different *Erionota* species on non-banana crops or weeds. Therefore it is assumed that palms and other non-Zingiberales are host plants for other *Erionota* species (e.g. Waterhouse and Norris, 1989).

The abundance and distribution of host plants in the PRA area are not discussed in the French document.

2.2.2.2. Suitability of environment

Although the Panel agree that there are similarities between the climatic conditions of the PRA area and the areas where the pest is currently present, no supporting data are provided in the pest risk assessment. Strong winds and heavy rainfall are detrimental to the pest, whereas establishment can be promoted by drought. It is especially important to note that the first instar drowns in the leaf rolls when rainfall is too intense, as this stage is not yet covered by the waxy powder that protects the following instars from drowning (Gold *et al.*, 2002). Monty (1977) states, that in Mauritius the feeding activity of larvae on banana is restricted to the period from December to July. Therefore, information on the rainfall pattern in the French overseas departments, the coincidence of the rainy season with heavy rainfalls and the vulnerable stages in the life cycle of the butterfly as well as a more detailed comparison of the climate conditions in Mauritius and Réunion, especially with regard to wind exposure and rainfall would be useful. This would have been particularly interesting for Réunion which has the highest rainfall worldwide (Barcelo *et al.*, 1997). *E. thrax* is also suppressed by strong winds (Ashari and Eveleens, 1974), which were also the reason for the massive decline of *E. thrax* in Mauritius in 1975 (Monty, 1977). This information is not included in the French document.

References for the biological data described in the French document and the environmental conditions (temperature, climate etc.) for the development of *E. thrax* are missing. No information is given on the number of generations per year.

2.2.2.3. Cultural practices and control measures

An important biological aspect that could affect establishment is the presence of natural enemies in the PRA area, as this species can be effectively suppressed by several parasitoids (e.g. Waterhouse and Norris, 1989; Lai and Funasaki, 1990; Lubulwa and McMeniman, 1998). However, the presence or absence of natural enemies in the PRA area is not addressed in the French document.

⁶ see also <http://intern.nhm.ac.uk/jdsml/research-curation/projects/hostplants/list.dsml?searchPageURL=browse.dsml&Family=Hesperiidae&Genus=Erionota&Country=&sort=PGenus>; November 2007

2.2.2.4. Conclusion on the probability of establishment

The Panel judges that the probability of establishment is high for all French overseas departments, due to the availability of host plants and similarity of climatic conditions with the areas of current distribution. This is in agreement with the conclusions of the French risk assessment.

2.2.3. Probability of spread after establishment

The probability of spread is not discussed in detail in the French document. No assessment is made of the mobility of larvae and adults. However, although more information should have been added, the Panel agrees with the conclusion of the risk assessment that, because bananas and palms are widespread in the French overseas departments, *Erionota* spp. would easily find host plants for spread. Long distance dispersal of adults up to 500 km per year has been reported (Waterhouse *et al.*, 1998). Long distance flight also seems to be possible. According to Waterhouse and Norris (1989), after its arrival in Oahu, Hawaii in 1973, *E. thrax* spread up to 150 km in the following two or three years to the other Hawaiian islands.

2.2.4. Conclusion on probability of introduction and spread

The probability of introduction was estimated in the French document in the summary box on the first page as moderate. The Panel concludes that *Erionota* spp. have a low probability of entry into the French Guiana, Guadeloupe and Martinique due to long distances from infested areas and a low likelihood for suitable pathways because of existing regulation. However, the probability of entry would be moderate in the absence of the current regulations. For Réunion, the probability of entry is higher due to its proximity to Mauritius where *E. thrax* is already present. The Panel judges that the probability of establishment is high for all the French overseas departments. This is in agreement with the French risk assessment conclusions but not with the summary box at page 1, which states “very high”. Concerning the abundance and spread of the pest in the French overseas departments however, there is some uncertainty about the impact of heavy rainfall on the larval survival.

The description of the endangered area is very vague, with almost all of the inhabited and cultivated areas of the French overseas departments, noting also that wild populations of *Heliconia* in Guadeloupe and Martinique could also act as host plants for the insect. Therefore the Panel considers that the pest would also be able to establish in non-cultivated semi-natural or natural areas.

2.3. Assessment of potential economic consequences

2.3.1. Direct pest effects

2.3.1.1. Crop quality and/or yield losses

The document claims that economic damage would be high as stated in the summary box of the French document or “extremely high” for Guadeloupe and Martinique and “fairly high” for French Guiana and Réunion in the conclusions of the pest risk assessment. The information given on damage and economic consequences in areas already infested outside the PRA area is sparse. No figures or estimates of economic losses are presented in the pest risk assessment except for Papua New Guinea, where, before the biological control programme, the percentage of defoliation and reduction in banana production is given (the pest caused about 60% leaf damage leading to around 30 % production loss; Waterhouse *et al.*, 1998).

In its native range, the defoliation of banana plants is usually very low due to the presence of natural enemies, but in non-native areas it can be very serious during outbreaks of the pest and favourable weather conditions (Kalshoven and van der Laan, 1981; Gold *et al.*, 2002). Complete defoliation of banana plants has been reported from some farms (Khoo *et al.*, 1991; Okolle *et al.*, 2006a), but such events are sporadic (CAB International, 2007). No plant death was recorded as a result of *E. thrax* infestation, but growth and yield of banana can be seriously affected by defoliation (Waterhouse *et al.*, 1998; Okolle *et al.*, 2006c).

For Mauritius, no recent literature has been found. The butterfly was probably introduced in the late 1960s; it was noted as a new insect pest in Mauritius by Monty in 1970. The degree of damage in Mauritius is not specified, but *E. thrax* was excellently controlled by introduced egg and larval parasitoids until a cyclone reduced its abundance significantly. Due to the low number of individuals of *E. thrax*, the parasitoids disappeared (Monty, 1977). As a consequence of their disappearance, the butterfly was common in Mauritius in 1977. According to Waterhouse and Norris (1989), damage in 1978 was very low and *E. thrax* was quite uncommon in 1988 (personal communication with J. Monty cited in Waterhouse and Norris, 1989). This is confirmed by Davis and Barnes (1991). The current situation is not known, and there have been no recent publications on this pest in Mauritius, implying that this pest is not important there – may be due to the biocontrol programme, however, it is not known if it was re-established after the cyclone. It is critical to the pest risk assessment that this is confirmed since the situation in Mauritius is very similar to the other French overseas departments, especially Réunion.

The French document states that banana growing is highly developed in Guadeloupe and Martinique, that it is a vital economic and social component because of the industrial production of bananas for export. It is less important for Réunion and French Guiana, but still significant for the local market. This is not underpinned by data. However, the Panel confirmed that a relatively large share of the agricultural area of Guadeloupe and Martinique is devoted to banana production and a relatively small share in Guyana and Réunion (see section 2.2.2.1.). Commercial *Heliconia* production on a small scale is known to occur in Guadeloupe (see section 2.2.2.1.).

2.3.1.2. Control measures, efficacy and costs

E. thrax has effectively been controlled by biological control agents in some areas of the world. In Malaysia (Okolle *et al.*, 2006a; 2006b), Papua New Guinea (Waterhouse *et al.*, 1998), Hawaii (Mau *et al.*, 1980; Lai and Funasaki, 1990) and other infested areas, biological control programmes were established using parasitoids of *E. thrax* eggs, larvae and pupae (*Ooencyrtus erionotae*, *Apanteles* (= *Cotesia*) *erionotae*, *Brachymeria euploae* and others).

Mechanical practices such as the removal of eggs by clipping off leaves where they were laid, clipping off leaf rolls and the collection and killing of adults are effective for small infested areas (Monty, 1977). Because of the sheltering effect of the leaf rolls, insecticides are not very effective against larvae (Okolle *et al.*, 2006b).

2.3.2. Indirect pest effects

2.3.2.1. Export markets

No information is provided in the French document regarding export markets. The Panel found that Martinique exported a net total of 228,358 tonnes (\approx 178 mln euros)⁷ of bananas in 2005, representing 93% of local production (Aumand, 2006). In 2004, 251,695 tonnes of bananas were exported, representing 89% of the total production of banana varieties intended for export (Agreste, 2006a). In Guadeloupe, the export of bananas was 65,730 tonnes in 2004 and 51,700 tonnes (\approx 37 mln euros)⁷ in 2005, *i.e.* respectively 75% and 80% of the total production of banana varieties intended for export (Agreste, 2006b).

Banana production of Guadeloupe and Martinique is mainly exported, with the EU being the primary trading partner (Lassoudière, 2007). Currently, *Erionota* spp. are not regulated in the EU.

In French Guiana and Réunion, banana production is for local consumption only (DAF Guyane, 2001; Le Jeannic, 2002).

2.3.2.2. Social consequences

The document does address any potential social consequences as a result of the pest's establishment in the PRA area only very generally by stating that banana-growing in Guadeloupe and Martinique is a vital social component, based mainly on the production for export of the standard Cavendish varieties. The Panel agrees that banana production is important for employment in Guadeloupe and Martinique. The banana industry provides 7,000 direct jobs in Martinique and 10,000 direct and indirect jobs in Guadeloupe. The additional control costs due to *Erionota* spp. may reduce the competitiveness of the banana industry in Guadeloupe and Martinique. However, the pest is known to be controlled by biological control agents in areas where it is already distributed. It is therefore assumed that the social impact would be low after biological control was established, though there is uncertainty regarding the applicability and effectiveness of biological control in Guadeloupe and Martinique.

Plantain and cooking banana are an important staple food and a large fraction is household-produced. Without control, the pest may cause high yield losses and a potential disruption of subsistence production and consumption patterns would occur. This may also cause negative social impacts. Similar social effects are envisaged for shifting cultivation in Guiana, where banana is one of the associated crops. There is uncertainty regarding the availability and the costs of substitution foods, should the yield of cooking banana and plantain be substantially reduced.

2.3.2.3. Environmental consequences

According to the French document, a presumed environmental risk is to ornamental and wild plants (bananas, Zingiberales, possibly palms). However, impacts are neither specified nor quantified, only a statement that wild populations of *Heliconia* in Guadeloupe and Martinique could be threatened. Concerning the risk for palms and host plants other than banana, it is not clear, how severe the damage for these would be or even if there would be any.

⁷ based on average prices at departure for the first semester 2005 (Agreste 2006. La statistique agricole. Le Bulletin. Séries chronologiques, 13, Guadeloupe, 1^{er} Semestre 2006, 4 pp.)

2.3.3. Conclusion of the assessment of economic consequences

The conclusion of the pest risk assessment that the economic impact would be “extremely high” for Guadeloupe and Martinique and “fairly high” for French Guiana and Réunion cannot be justified on the basis of the information provided in the risk assessment, as there is a high degree of uncertainty associated with host plants, impacts and losses are not estimated and the area of cultivation of banana is not given. The Panel acknowledges that according to the literature, *E. thrax* (and closely related species), may have severe impacts on banana in certain particular situations, e.g. in the beginning of an infestation, under drought conditions or without the presence of natural enemies (Christie *et al.*, 1989; Waterhouse and Norris, 1989; Waterhouse *et al.*, 1998; Gold *et al.*, 2002; Okolle *et al.*, 2006a; Okolle *et al.*, 2006b). However, claims in the French document that the economic impact would be extremely high appear to be over-estimated, as the pest does not cause the death of the plants or directly attack the fruit although growth and yield of banana can be seriously affected by defoliation. For Mauritius, no further reports on damage are available and the current status of the pest is not known. This suggests that although impacts may be high in the short-term, the implementation of biological control programmes, known to have been effective in areas where *Erionota* spp. are currently present (Indonesia, Mauritius) may reduce the economic impact.

There are further uncertainties regarding the effects on *Heliconia* cut flower production, as its importance in each of the four French overseas departments is not discussed in the document, and the potential environmental impact, such as soil erosion and biodiversity, as a result of the death of *Musa* and *Heliconia* plants in the PRA area.

2.4. Comments on the conclusion of the pest risk assessment

The document concludes that *Erionota thrax* should be classified as a quarantine organism for the endangered area of French Guiana, Guadeloupe, Martinique and Réunion.

In the conclusions on probability of entry, the French document identifies natural spread as an additional pathway of entry. This pathway was not included in the assessment presented earlier in the document.

The Panel concludes, in contrast to the French risk assessment’s conclusion (“fairly low”) that the probability of natural entry (meaning natural spread from already infested areas) is extremely low for Guadeloupe and Martinique due to the long distances from locations where the species occur. The probability for natural entry into Réunion is higher since *E. thrax* is already present in the neighbouring island, Mauritius.

Entry by military or other aircraft is not discussed in the French document, but could also be a pathway. According to Waterhouse and Norris (1989), the pest entered Mauritius by military aircraft from Malaysia. To clarify, if this could be a pathway for the French overseas departments, it should be verified, whether military aircraft are arriving from infested areas.

The probability of entry via “trade” and “passengers” is assessed in the French document as “significant” if the current import ban on host plants is lifted. The Panel agrees in principle that the probability of the pest’s entry into the French overseas departments would increase with the lifting of the ban.

Although more information is available on the establishment potential and should have been included to support the conclusion in the French risk assessment, the Panel agrees that the rating of the probability of establishment is high for French Guiana, Guadeloupe, Martinique and Réunion.

The conclusion of the pest risk assessment that the economic impact would be “extremely high” for the Guadeloupe and Martinique “fairly high” for French Guiana and Réunion cannot

be justified on the basis of the information provided in the risk assessment, as losses are not estimated and the area of cultivation of banana is not given. The Panel acknowledges that *Erionota* spp. can have severe impacts on banana in certain situations, e.g. in the beginning of an infestation, under drought conditions or without the presence of natural enemies. The Panel also agrees that growth and yield of banana can be seriously affected by defoliation. However, claims that the economic impact would be extremely high appear to be over-estimated, as the pest does not cause the death of the plants or directly attack the fruit and the implementation of biological control programmes may reduce the economic impact.

2.4.1. Degree of uncertainty

The Panel concludes that the degree of uncertainty is high. This is insufficiently addressed in the French document. The main areas of uncertainty are:

- the differentiation of the several similar *Erionota* species and the resulting confusion in the literature,
- the pathway that led to the introduction of *E. thrax* into Mauritius,
- the current situation in Mauritius concerning the abundance of *E. thrax* and any damage it causes,
- host preferences of *E. thrax* subspecies,
- wild palms and palms in general as hosts,
- life cycle on host plants other than banana,
- probability of entry on palms,
- impact on bananas and economic consequences,
- impact on other host plants,
- the presence of natural enemies,
- impact of heavy rainfall on the potential for spread of *Erionota* spp. in the French overseas departments and particularly in Réunion,
- the pest's absence in Réunion, as the pest occurs in Mauritius.

Many of the uncertainties in the risk assessment (impacts on palms, pathways etc.) would be reduced by additional information on the situation in Mauritius. The French document only refers to one article with regard to Mauritius, but, though more information was found by the Panel (Monty, 1970; Waterhouse and Norris, 1989; Davis and Barnes, 1991), information gaps on pathways, current impacts and abundance in Mauritius remain.

CONCLUSIONS AND RECOMMENDATIONS

The Panel concluded that it is not possible to conduct a risk assessment on *E. thrax* alone because of uncertainties with its taxonomy and the general confusion in the literature about *Erionota* spp. The document is therefore, in effect, not a risk assessment just for *E. thrax* but also for three other closely related *Erionota* spp. (*E. torus*, *E. hiraca*, and *E. surprisa*). The judgements made by the Panel – if not specified otherwise – thus refer to all four of these closely related *Erionota* spp.

On this basis, the Panel, in general, accepts the conclusions in the French document. The Panel agrees that *Erionota* spp. currently have a low probability of entry for French Guiana,

Guadeloupe and Martinique due to the long distance from its current area of distribution and the existing phytosanitary legislation. However, the probability of *Erionota* spp. gaining entry to French Guiana, Guadeloupe and Martinique would be moderate if the current regulations governing imports of banana material were lifted. The probability of entry for Réunion is higher due to its proximity to Mauritius where *Erionota* spp. are present. The probability of *Erionota* spp. establishing in the PRA area after entry is high, since host plants are grown in the PRA area and the climatic conditions are similar to the areas where the 4 species currently occur.

The *Erionota* spp. can have severe impacts on banana in certain situations. The conclusion of the French document is that the economic impact would be “extremely high” for Guadeloupe and Martinique and “fairly high” for French Guiana and Réunion. This cannot be supported by the Panel on the basis of the information provided in the pest risk assessment or from the information available in the scientific literature. Based on the information available, the Panel concludes that the impact of *Erionota* spp. would be low for French Guiana and Réunion and moderate for Guadeloupe and Martinique. However, without additional information on the pest and the impacts it causes in Mauritius, the risk posed to Réunion and the other French overseas departments cannot be reliably clarified.

The Panel concludes that (a) the probability of entry is low for French Guiana, Guadeloupe and Martinique and higher for Réunion, (b) the probability of establishment is high for all the French overseas departments, and (c) the potential for economic damage is low for French Guiana and Réunion and moderate for Guadeloupe and Martinique.

The Panel underlines that the degree of uncertainty is high, particularly regarding the economic impact of the organism, more detailed information on the situation in Mauritius, and the clarification of host plants and pathways, in particular *Areceaceae*.

The Panel, based on the information provided in the document and on additional literature consulted, concludes that *E. thrax* and the three closely related *Erionota* spp. are appropriate for evaluation of pest risk management options for the endangered areas of French Guiana, Guadeloupe, Martinique and Réunion and thus potentially eligible for addition to the list of harmful organisms in Directive 2000/29/EC.

DOCUMENTATION PROVIDED TO EFSA

1. Letter, dated 14 July 2006 with ref. SANCO E/1/VE/svi D(2006) 510488 from P. Testori Coggi to C. Geslain-Lanéelle.
2. Analyse du Risque Phytosanitaire BAN-a1 : *Erionota thrax*. Rédaction : Serge Quilici, Romain Camou / CIRAD – Juin 2003.

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