

A newly observed important pest on germinating coconuts in Indonesia

Pterolophia apiceplagiata Breuning, Coleoptera Cerambycidae

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Summary. — This is the first time that the Cerambycidae *Pterolophia apiceplagiata* has been observed as a coconut pest. Its larvae develop on the floss covering the germ pores and then in the fibrous husk. If there is a germ, it may be partially or totally destroyed. The pest has been observed in Indonesia, where in South Sumatra, it can affect 14.5 to 31.4% of nuts. The insect can also develop in the inflorescence peduncle after nut collection. The development cycle lasts 2.5 to 3 months.

Control is particularly important in seed gardens affected by the insect. Notched nuts are soaked in a Monocrotophos solution. Injecting the solution near the germ is more effective. The elimination of the empty inflorescences after harvesting is the most effective way of controlling the pest in the long term.

Key words. — *Pterolophia*, pest, coconuts, Indonesia, incidence, chemical treatments, cropping practices.

INTRODUCTION

In Sumatra, Indonesia, a coconut pest which had never been recorded before has been discovered attacking the germinating nuts in seedbeds. The low rate of germination observed was initially attributed to the fungus *Marasmiellus*, which was indeed present, but not the cause of all the damage. In many ungerminated nuts, a small insect emergence hole was found leading to the germ pore area where faeces could be seen. A larva was seen eating the germ and the insect involved was identified as a Cerambycidae, Lamiinae : *Pterolophia apiceplagiata* Breuning.

The main features of the biology of this pest have been studied, the extent of the damage determined and the behaviour of this Coleoptera analysed in order to establish a method of control.

Treatments by dipping the nuts, notched beforehand, in a solution of insecticide or by injection of a dose of this solution into the husk have been tested.

Cropping practices were also investigated in order to reduce the incidence of this very harmful pest on the germinating nuts.

This paper reports the results achieved.

DESCRIPTION AND DISTRIBUTION

Adult

The length of this cerambycid ranges from 9.67 mm to 14.67 mm, average 11.77 mm. A marked variation in size between the specimens also occurs in the beetles that were obtained from rearing, i.e. from 8.66 mm to 12.00 mm.

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Like many Lamiinae, the head of *Pterolophia apiceplagiata* is bent downwards, with its eyes completely separated in two lobes. The pronotum is rounded, with the lateral borders nearly parallel and without spines, like other species of this subfamily. The width of the pronotum is 3.10 mm on average (2.42 to 3.75 mm), but the body of *Pterolophia* is very enlarged at the humerus level of the elytra, 4.18 mm on average (3.25 to 5.25 mm).

The body is covered with dark and yellowish-grey pubescence with a tendency to form two longitudinal and parallel bands on the pronotum. These bands are more marked at the base. The pilosity on the elytra is more yellowish-white and more dense near the scutellum, forming a triangle. Two lines of the same colour run obliquely from the humerus to the middle of the elytra, with a large transverse band, not clearly defined, near the extremity.

The antennae reach as far as this large transverse band, shorter than the body in both sexes. The pilosity is yellowish-grey at the base of the first and fifth articles, then black, except for a fine line of the same kind of pilosity at the end of the segments. The scape is dark brown and spotted. The second article is entirely covered with this pilosity, the third at the base and not at the extremity, the fourth curved inwards with numerous white pilosity from the base to the middle on the internal part. The legs are also spotted with this yellowish-grey pilosity (Fig. 1).

Larvae

At the end of development, the full grown larva reaches 18.3 to 20.5 mm in length and 3.6 to 3.8 mm in width. Its coloration is pinkish-white and the stigmata are slightly orange. The mandibles are black (Fig. 2).

Pupa

The pupa is 15.2 mm long, 4.5 mm wide, ivory white in colour, with its antennae, legs and wing rudiments more greenish and translucent. On the dorsal part of the pupa, there are some bristles and short spines, fairly dense depending on the different segments. On the last segment, there are

strong lateral denticles, which form a complete crown at the extremity (Fig. 3).

Distribution

In Sumatra, we have found this insect to be very numerous in coconut seed gardens in Lampung, as well as in the area around Palembang, also always in seed gardens. In North Sumatra too, near Lubuk Pakam, *Pterolophia* has been detected on some nuts in the seed garden. But it seems that in North Sumatra, populations of *P. apiceplagiata* are smaller than in Lampung. This is perhaps due to the high rainfall in North Sumatra at the time of the observation. This insect was also very common in seedbeds in Riau on the new industrial plantation, for which the nuts were dispatched from Lampung with the larvae before they were detected.

This insect, unnoticed until now, is probably widespread in Indonesia. The *P. apiceplagiata* species was described by Breuning from Borneo.

Furthermore, according to the specialist in Cerambycidae at the French Natural History Museum, it seems that *Pterolophia saigonensis* Breuning found on palms can be a synonym. Therefore this species is also present in South Vietnam.

Finally the genus *Pterolophia* is widespread with many other species occurring in South East Asia, the Pacific region and Africa where some species may perhaps also adapt to the coconuts.

BIOLOGICAL FEATURES

1. — Behaviour

This species was not detected during the day in the seed garden although cerambycid population levels on the nuts were very high. All our investigations to find adults in the crown and in-between the nuts were unsuccessful. In the night, due to the brown and yellowish-grey coloration of the adults, they are very difficult to find. Some adults were found scattered on the stem or the cover crop, but they were not very active during the day.

Recently, near 2-3-month old seedbeds that had already been attacked, we found that many adults were present on the 4-month old seedlings nearby.

The adults were resting inside the folds of the young leaves that had just unfurled. They were not active during the day, but were resting near elongated eaten patches along the midribs. In fact, *Pterolophia* feeds on very young leaves during the evening and night.

The insects partly fed on the lamina and the midrib. This damage, generally about 20 mm long and 5 mm wide, with some fibres remaining on the edges of the cut, is very easy to recognize. There were numerous patches of damage, mostly on the seedlings near the seedbeds. About 18 seedlings with feeding tracks were found on each row of 100 coconuts in polybags, especially on the part of the row closest to the seedbed.

Using fresh young leaves we were able to rear live adults for nearly two months. Therefore in seed gardens of taller palms, the young leaves need to be checked for adults. They probably have a feeding phase before egg-laying which explains why it is sometimes very difficult to find the adults on the nuts if they are not in the reproduction period.

2. — Type of damage

A nut, cut in the early stages of an attack, presents a gallery which starts from the point where the nut was attached to the branches, and extends towards the germinating pores. When the husk is opened very carefully, the young larva can

be seen in the gallery. However, when the husk fibres are cut, the larva is generally crushed and cannot be seen. Invariably, signs of feeding can be observed at the level of the pores with presence of an accumulation of small brownish pellets which are larval faeces. This is very characteristic of the presence of a larva. One, two or three germ pore sites can be attacked. At this level, the young larva feeds a little on the fibres, but apparently mostly of the floss covering the germ pores. It seems that the larva is also able to bore at this point, sometimes perforating the pore. However, the damage is usually only on the germs, if any. By this time, the *Pterolophia* larva is already big enough to attack and eat the germ or damage it so severely that it will rot. Even germs that are already developed but damaged at the base will develop abnormally and will have to be discarded. This damage affected mature nuts and the first symptoms were found only in bunches of mature nuts of about twelve months. This has no consequence on the meat of the nuts, but can be very harmful for germination.

3. — Life cycle

The gallery, starting from the point of attachment of the nuts to the branches and extending towards the germ pores, means that egg-laying must take place near or just under the floral pieces remaining on the nut at maturity. It also requires the nut to be sufficiently dry. The nuts with early damage, collected from the tree or on the soil, were still a little green. But rounded scars are sometimes seen on younger nuts, which can mean unsuccessful attempts at egg-laying and larval development on tissues that were still too active.

After developing at the level of the germ pores and feeding directly on the germ, the mature larva of *P. apiceplagiata* bores a gallery inside the husk to the exterior part of the nut moving in a wriggling manner.

The length of this gallery from the germ pore area to the periphery of the nut is about 60 mm. The larva then starts to make a pupal chamber.

The size of this chamber is 18.0 to 28.3 mm long by 14.4 to 21 mm wide, depending on the size of the larva at maturity. This chamber is filled with cut pieces of coarse fibres. The gallery is sealed with faeces and half digested fibre particles often forming a plug up to 25 mm long. Inside the chamber, the larva pupates in the middle of the coarse fibre cuttings in a cavity 6.5 mm long and 5.7 mm wide.

The average pupation period is 11.2 days (10 to 13) with an additional period of 2.4 days (2 to 3) for hardening of the tegument before the adult emerges. For emergence the adult cuts a hole, about 5.0 mm by 3.9 mm, on the surface of the nut adjacent to the pupal chamber. This hole is easy to see on the surface of the affected nuts in the seedbed. But when the adults emerge from the part of the nut which is notched and the hard epidermis removed, this track is often not visible.

The larval development period is eight weeks from the time the nuts are collected in the fields with the first larvae and presence of some eggs to the pupal stage.

Stages	Duration of the life cycle		
	Days	Range	Average
Egg incubation		± 1 week	± week
Larval development		56 (maximum)	56 (maximum)
Pupation		10 - 13	11.2
Resting period before emergence		2 - 3	2.4
Adult maturation before egg-laying		?	?
Total		75 - 79	76.6

FIG. 1. — Adult of *Pterolophia apiceplagiata* Breunig, Coleoptera Cerambycidae, pest on germinating husk.



FIG. 3. — Pupa of *Pterolophia* inside a chamber of coarse fibre cuttings at the nuts periphery



FIG. 2. — Full grown larva of *pterolophia apiceplagiata* tunnelling inside the fibrous husk

Remark. — The eggs probably hatch in no more than one week. But the adult feeding period before egg-laying may be rather long. Hence the total life cycle of *Pterolophia apiceplagiata* Breuning must be about two and half months but not more than three months.

EXTENT OF *PTEROLOPHIA* *APICEPLAGIATA* DAMAGE

1. — Extent of damage in the seed garden

In order to assess the level of damage in the seed garden, the mature nuts at twelve months were collected directly on the bunches before they fell.

A sample of 100 nuts was opened immediately in order to check for affected nuts and 400 placed on the soil, split uniformly, with 10 nuts per palm circle. Every two weeks, a sample of 100 nuts was taken and opened. The observations were conducted over eight weeks (Table I).

TABLE I. — Damage evolution on nuts in the seed garden at different stages after collection (*Pterolophia apiceplagiata* Breuning, Col. Cerambycidae)

Observation times	Nuts collected on bunches	Nuts on the soil after			
		2 weeks	4 weeks	6 weeks	8 weeks
Larva	4	21	29	28	30 ⁽¹⁾
Gallery (tracks)	9	5	15	15	13 ⁽²⁾
Healthy nuts	87	74	56	57	54
% attack	13	26	44	43	43

Presence of different instars

(1) 7 young larvae, 21 old larvae, 2 pupae

(2) 2 new tracks, 11 old tracks

The results show that 13 % of the nuts collected before they fell were already affected, which proves that the attack occurs while the nuts are on the tree. In the case of nuts placed on the soil, checks after two weeks show that the percentage of affected nuts increases very quickly to 26 % with 21 nuts having larvae instead of only 4 previously. After six weeks, the percentage is 43 % with larvae inside 28 nuts. It seems that between the fourth week and the sixth to eighth week, the percentage levels off, with 44 %, 43 %, 43 % and 29, 28, 30 nuts with larvae respectively.

There therefore seems to be an evolution of the pest population which was present on the nuts in bunches at the time of harvest and which developed from eggs or very young larvae that were not detectable, into bigger visible larvae. After this development, a stable level of attack is reached and the population does not increase. This also suggests that eggs are not laid on nuts already collected in heaps.

2. — *Pterolophia apiceplagiata* incidence on different types of nuts

In the Malayan Yellow Dwarf seed garden, there are variations between different blocks, but the average infection level of 21.25 % is comparable with the 24.12 % on the same type of nut already dispatched (Table II).

From another area, Nias Yellow Dwarf × Tenga Tall (Khina I) nuts, already dispatched, were 26.56 % affected. Only the Cameroon Red Dwarf seems less affected.

TABLE II. — Incidence of *Pterolophia apiceplagiata* Breuning on different types of nuts from the seed garden

Damage samples	No of nuts observed	Healthy nuts	Presence of larvae	Galleries + damaged germs	% nuts attacked
MYD × WAT (Seed garden)					
B1.9 - 14	35	27	5	3	22.86
9 - 12	25	22	1	2	12.00
8 - 8	25	17	5	3	32.00
9 - 15	25	19	1	5	24.00
8 - 7	25	20	1	4	20.00
(near forest)					
8 - 7	25	21	1	3	16.00
(open area)					Av. 21.25
MYD × WAT (dispatched)	87	66	12	4 + 5	24.12
NYD × TT Khina I (dispatched)	64	47	5	7 + 5	26.56
CRD (Seed garden)	25	24	1	0	4.00

NB : MYD = Malayan Yellow Dwarf

WAT = West African Tall

CRD = Cameroon Red Dwarf

TT = Tenga Tall

3. — Presence of *Pterolophia* in commercial fields

During dehusking, samples of nuts from the commercial fields were checked (MYD × WAT, PB 121, Planting year 1982). *Pterolophia apiceplagiata* was also detected. In the results, only the nuts with sufficiently dry husks were observed (Table III).

TABLE III. — Damage to nuts in commercial coconut fields (PB 121) caused by *Pterolophia apiceplagiata* Breuning

Damage replications	Gallery (old tracks)	Gallery (new tracks)	Larvae	Healthy nuts	% attack
I	9	4	3	84	16
II	9	3	5	83	17
Total	18	7	8	167	16.5 Av.

In these samples, attacks by the cerambycid beetle on 16.5 % of nuts prove that it occurs not only in the seed garden, but also in commercial fields. Therefore *Pterolophia* is a general pest of coconuts but only has an impact on the germination of nuts produced for hybrids.

CONTROL METHODS

In order to control larvae or adults inside the nuts, treatments were carried out by dipping the nuts in a solution of Monocrotophos at the rate of 0.6 g a.i./l water, or by injec-

ting the nuts near the germ pore area with the same solution. Cropping practices to reduce *Pterolophia* population levels were also investigated.

1. — Treatment by dipping the nuts in an insecticide solution

After notching in order to facilitate the penetration of the product, the nuts were dipped in a solution of Monocrotophos with 0.6 g a.i./l water for 3, 5, 7, 10, 15 and 20 minutes in each trial. Observations were made 15 days after the treatment (Table IV).

The results show that attack incidence is apparently reduced, even though healthy larvae and some adults are always present. It is very difficult with this method to obtain good product penetration, as the air in the husk prevents the liquid from flowing smoothly inside.

TABLE IV. — Results of treatment by dipping the nuts in a solution of Monocrotophos (0.6 g a.i./l water) (observations after 15 days)

Damages time mn	No of nuts	Galleries (tracks)	Live larvae	Dead larvae	% nuts attacked
Before treatment	32	5	2	0	21.9
3	32	4	1	0	15.6
5	32	2	1 (adult)	0	9.4
7	32	6	0	0	18.7
10	32	5	1	1	21.9
15	32	4	1	0	15.6
20	32	15	1 (big)	0	50.0
Not treated	32	6	3	0	28.1

2. — Treatment by injection of the nuts

To ensure better results, a trial was conducted by injecting the same solution of Monocrotophos at the rate of 0.6 g a.i./l water into the germ pore area with a syringe. The needle was blunted in order to avoid damage to the germ. For this, a fungicide solution of Dithane M 45 at a rate of 3 g c.p./l water was added to prevent any damage. A dose of 5, 10 and 15 cc of the Monocrotophos solution was injected by pushing the needle laterally into the germ area. After 15 days, the nuts were checked (Table V). After this treatment, no live larva was found. It therefore seems that a mere 5 cc of the Monocrotophos solution at 0.6 g a.i./l water is sufficient to control this pest.

The results for this method are comparable to the dipping method. One worker can inject about 4000 nuts per day, whilst in an 800-litre tank, 300 nuts can be dipped simultaneously. However, one worker cannot treat much more than 4000 nuts per tank per day because of the handling operations entailed by this dipping method.

3. — Prospects for treatment against the cerambycid beetles

As the adults feed on young, just unfurled leaves, it would be interesting to treat the foliage with an insecticide, once or

twice at fortnightly intervals, in order to reduce the adult population. However, this will not prevent reinfestation by cerambycids if their breeding sites are not treated. Obviously, this site must be outside the nuts where *Pterolophia* develop, due to the fact that the nuts are harvested before the pest can complete its life cycle.

TABLE V. — Results of treatment with a Monocrotophos solution by injection in the nuts near the germ

Doses Observations (15 days after tr.)	Solution Monocrotophos (0.6 g a.i./l water)			
	5 cc/nut	10 cc/nut	15 cc/nut	Control
Live larva	0	0	0	4
Gallery (old track)	3	4	1	3
Healthy nuts	22	21	26	18
% larval attack	0	0	0	16

4. — Cropping practices and phytosanitary conditions

In the search for the breeding site of this cerambycid, whose larvae are so common on nuts in seed gardens, no remaining tree trunks, palm stems or stalks of other plants were observed to be a source of this pest. But we found that the peduncles of bunches fallen from palms after harvesting and gathered in the interrows, were full of larvae of this Cerambycidae.

Even the peduncles of empty bunches still hanging and drying on the coconut stems were also observed to be infested by the larvae of *Pterolophia*. The breeding site of this pest is the empty bunches hanging on the coconut palm itself (Table VI).

TABLE VI. — Presence of *Pterolophia apiceplagiata* Breuning in the inflorescence peduncles after harvesting

Level Damage	Peduncles sampled		Total
	On the stem	On the soil	
Larvae mature	2	7	9
small in branches	10	11	21
dead	3	2	5
	= 17	= 18	= 35
Galleries (empty) + holes (adults)	16	39	55
Healthy Peduncles	31	52	83
% affected	51.6	52.3	52.02

During the checks, the peduncles were seen to be affected to the same extent, whether collected from the interrows on the ground or directly from the palm: 52.3% and 51.6% respectively. The position of the holes from which the adults emerged and the direction of the gallery inside the peduncles show that egg-laying occurs mostly at the level of the nuts

on the branches and of course also on the nuts. The cerambycid larva bores from this extremity to the base of the peduncle. Galleries of up to 24 cm in length were observed. Therefore, conditions are perfect for the development of the larvae of *P. apiceplagiata* when the empty bunches are left hanging on the stems for months or when they are thrown together in the interrows after collection.

CONCLUSION

This unnoticed pest of coconut on germinating nuts is apparently widespread in Sumatra and Kalimantan in Indonesia, and also in other parts of South East Asia. The genus *Pterolophia*, found across the tropics, also probably has some species that behave similarly in other countries.

The incidence of this insect can explain the low germination rate sometimes observed in coconut seedbeds. The damage caused by this pest on germinating nuts was often confused with that resulting from the fungus *Marasmiellus*. This fungal problem can increase in severity due to the fact that cerambycid larvae eat and injure the germ.

This pest, affecting only nut germination in nurseries, has no effect on nuts in commercial fields, cultivated for other purposes.

The extent of the damage on nuts in seedbeds varies from 14.5 % to 31.4 %. In seed gardens, nuts are attacked directly on the coconut bunches, where fruits collected at maturity show 13 % infestation. After four weeks, with the develop-

ment of the insect inside the husk, this percentage can reach 44 % in nuts left on the ground.

With a short life cycle of 2.5 to 3 months, this borer of nuts can cause highly frequent, almost constant damage in seed gardens, and treatments are necessary. In order to control the problem, complete protection is ensured by injecting near the germ 5 cc dose of solution of Monocrotophos at a rate of 0.6 g a.i./l water. The treatment by dipping the nuts in a similar solution, though slightly faster, is less effective as there are some live larvae always remain.

In the long term, the most effective measure to control the pest is the elimination of the empty inflorescences where the beetle breeds and multiplies. Phytosanitary protection ensured by immediately cutting away the empty inflorescences from the stems after harvesting the nuts, removing the empty bunches from the interrows, and then disposing of them by burning.

Pterolophia apiceplagiata Breuning, Coleoptera Cerambycidae, Laminae is a very harmful pest on germinating nuts. The damage caused by this pest must be taken into account in seed garden management in order to prevent low germination rates.

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RESUME

Un important ravageur nouvellement observé sur sémences de cocotiers germées en Indonésie (*Pterolophia apiceplagiata* Breuning), Coléoptère Cerambycidae

R. DESMIER de CHENON, M. ASJ'ARI, W.T. KITU, *Oléagineux*, 1991, 46, N° 8-9, p 321-327.

C'est la première fois que le Cerambycidae *Pterolophia apiceplagiata* est signalé comme ravageur de la noix de coco. La larve se développe dans la bourre couvrant les pores germinatifs et ensuite dans la bourre fibreuse. Si le germe est présent, il peut être partiellement ou totalement détruit. Le ravageur a été signalé en Indonésie, dans le sud Sumatra, où

RESUMEN

Una plaga importante identificada hace poco en semillas de cocotero germinadas en Indonesia (*Pterolophia apiceplagiata* Breuning), Coleóptero Cerambycidae.

R. DESMIER de CHENON, M. ASJ'ARI, W.T. KITU, *Oléagineux*, 1991, 46, N° 8-9, p 321-327.

El Cerambycidae *Pterolophia apiceplagiata* se advierte por primera vez como plaga de la nuez de coco. La larva se desarrolla en la borra que cubre a los proros germinativos, y luego en la borra fibrosa. Si el germen está presente, puede quedar parcial o totalmente destruido. La plaga se advirtió en Indonesia, en el Sur de Sumatra donde puede afectar de un 14,5

il peut affecter de 14,5 à 31,4 % des noix. L'insecte peut se développer aussi dans le pédoncule des inflorescences après collecte des noix. Le cycle de développement est de 2,5 à 3 mois.

La lutte est particulièrement recommandée dans les champs semenciers affectés par l'insecte. On trempe les noix entaillés dans une solution de Monocrotophos. L'injection d'une solution près du germe est plus efficace. Éliminer les inflorescences vides après récolte, est considéré, à long terme, comme la meilleure méthode de lutte.

Mots clés. — *Pterolophia*, ravageur, noix de cocotier, Indonésie, incidence, traitements chimiques, pratiques culturales.

a un 31,4 % de las nueces. El insecto puede desarrollarse también en el pedúnculo de las inflorescencias después de recogerse las nueces. El ciclo de desarrollo es de 2,5 a 3 meses

El control se recomienda especialmente en los campos de producción de semillas afectados por el insecto. Se hace una muesca en las nueces, remojándolas en una solución de Monocrotophos. Es más eficaz inyectar una solución cerca del germen. Se considera que el mejor método de control a largo plazo consiste en eliminar las inflorescencias que ya no llevan fruto después de la cosecha.

Palabras clave. — *Pterolophia*, plaga, nuez de coco, Indonesia, incidencia, tratamientos químicos, prácticas de cultivo



NUMÉRO SPÉCIAL – SPECIAL ISSUE

Un prochain numéro d'Oléagineux 1991, Revue Internationale des Corps Gras, sera entièrement consacré aux Ravageurs du Palmier à Huile en Asie du Sud-Est. Ce numéro spécial comprendra une trentaine de fiches sur les principaux Ravageurs et sera illustré de très nombreuses photographies en couleur ; il sera traduit en anglais et en indonésien.

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An upcoming issue of Oléagineux in 1991, the International Oils and Fats Review, will be entirely given over to Oil Palm Pests in Southeast Asia. This special issue will comprise around thirty data sheets on the main Pests and will be illustrated with a large number of colour photographs. It will be translated into english and indonesian.

Copies of this work, which will be a reference in its field, can now be ordered, singly or in bulk, at a price of FF 150/\$ 25.