

OBSERVATIONS ON THE LIFE HISTORY OF *XYLEBORUS*
MORSTATTI IN THE IVORY COAST¹

Met een samenvatting: Waarnemingen omtrent de ontwikkeling van
Xyleborus morstatti in de Ivoorkust

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INTRODUCTION

Xyleborus morstatti Hag., the black twig borer, causes considerable damage in coffee plantations in the Ivory Coast, the third ranking coffee producing country in the world. The borer prefers the coffee variety 'Robusta' which is the most important variety grown in the Ivory Coast. Other plants can also be attacked e.g. cacao (*Theobroma cacao* L.), avocado (*Persea americana* Mill.) and cola (*Cola nitida* (Vent.) Schott & Endl.) vel aff.

The beetle bores its brood galleries in well hardened but not too old coffee twigs. A fungus, the so called Ambrosia, grows on the wall of these galleries and serves as food for the offspring of the beetle. Various other fungi are able to attack the branches through the galleries and in many cases the mechanical damage together with the attack of these secondary fungi result in dying of the coffee twigs. The estimated loss is about twenty percent of the total production in the Ivory Coast.

The present study is a part of an investigation into the factors determining the host plant selection of *X. morstatti*.

METHODS

Beetles were reared in the laboratory in small wooden boxes (3×23×33 cm), each box containing ten defoliated coffee shoots. The cut ends of the shoots were held by means of rubber stoppers and extended into water filled plastic tubes. This kept them in a fresh condition. The upper side of each box was covered with a glass plate; additional illumination was provided by fluorescent tubes. Forty young females of *X. morstatti* were introduced per box. Under these conditions about 30 % would bore a new gallery.

Data on the life history of *X. morstatti* were collected both in the laboratory and in the field by opening galleries of a known age (2 to 50 days old; each age in ten repetitions). In the field newly bored galleries were marked each day on a number of selected trees.

RESULTS AND DISCUSSION

The results are given in table 1. The third column shows data obtained by LAVABRE (1958, 1959) in the Cameroons.

¹ Accepted for publication 16 November, 1961.

TABLE 1. Data on the life history of *X. morstatti*.
Gegevens over de biologie van *X. morstatti*.

	Field ¹ Veld	Laboratory ¹ Laboratorium	According to Lavabre Volgens Lavabre
Pre-oviposition period (in days)	1.4	1.8	6-10
<i>Pre-ovipositie-periode (in dagen)</i>			
Duration of the egg stage (in days)	3.6-4.6	3.7-3.8	3-6
<i>Duur van het eistadium (in dagen)</i>			
Duration of the larval stages (in days)	9-15	8.5-15	8-18
<i>Duur van het larvestadium (in dagen)</i>			
Minimum duration of the pupal stage (in days)	8	6	5
<i>Minimum duur van het popstadium (in dagen)</i>			
Females of new generation leaving galleries after days	28-43	25-45	
<i>Wijfjes van nieuwe generatie, na dagen de boorgangen verlatend</i>			
Egg production / female / day	2.4	2.1	
<i>Eiproduktie / wijfje / dag</i>			
Minimum number of offspring	1	0	
<i>Minimum aantal nakomelingen</i>			
Maximum number of offspring	58	58	54
<i>Maximum aantal nakomelingen</i>			
Average number of progeny	16.0	13.6	
<i>Gemiddeld aantal nakomelingen</i>			
Predominant number of progeny	6-10	0-5	20-30
<i>Overheersend aantal nakomelingen</i>			
Number of larval stages	3	3	2
<i>Aantal larvale stadia</i>			
Average length in mm of gallery	8.0	8.1	
<i>Gemiddelde lengte van de boorgang in mm</i>			
Sex ratio females / males	6.7	5.8	9 ± 2
<i>Geslachtsverhouding wijfjes / mannetjes</i>			

¹ Data based on 387 and 347 galleries, respectively
Gegevens gebaseerd op respectievelijk 387 en 347 boorgangen

The above figures show that in general the results in the field and in the laboratory are similar. The data found by LAVABRE are on certain points different from ours. KALSHOVEN (1958) reports the predominant number of progeny as less than 10 and the sex ratio females/males 4-5. These data were obtained from a small number of observations made on an infestation of *X. morstatti* on coca (*Erythroxylum novagranatense* (Morris) Hieron.).

In the field Ambrosia was found in one day old galleries in six out of ten cases observed. No one day old galleries were opened in the laboratory; however, in those two days old, Ambrosia was found in eight out of ten cases.

The duration of larval development is rather variable and this may be influenced by the rate of growth of the Ambrosia fungus. The white Ambrosia was always clearly visible on the walls of the young galleries. In one eleven days old gallery we failed to find Ambrosia and the wall was completely black. In older galleries this phenomenon was observed more and more frequently. We suppose that the larvae had consumed all the Ambrosia and that there had

not been a sufficient new growth. Therefore larvae hatching later will have less food at their disposal and will be retarded in their development.

The head capsules of the larvae were measured. It was found that the head capsules of larvae of the second and third instar are smaller in older galleries. This indicates that the retarded larval development is coupled with a smaller average size of the head capsules.

There was a nearly linear relation between the number of offspring in fully occupied galleries (after the end of the egg production and before the leaving of the young females) and the gallery length. About two individuals, either in egg, larval or pupal stage, are found in each mm length of gallery. Moreover, the data indicate that during the first few days, though the egg production has already started, the female is still enlarging the gallery.

There are two explanations for the above mentioned relationship:

- a. the female enlarges the gallery in proportion to its reproductive rate,
- b. the condition of the plant material in which the female bores the gallery influences the length of the gallery and as such the reproductive rate.

In contrast with the normal sex ratio of about 6 females to 1 male, in some galleries only male progeny were found. This happened in the field in 6 out of 176 checked cases and in the laboratory in 1 out of 131. The explanation of this is still uncertain. It may be a case of parthenogenesis and this possibility is now under investigation.

SAMENVATTING

In koffieplantages in de Ivoorkust wordt veel schade aangericht door de zwarte takkenboorder, *Xyleborus morstatti* Hag. De kever boort gangen in niet te oude takken. Op de wand van deze gangen groeit een schimmel, de zgn. Ambrosia, die als voedsel dient voor het nageslacht van de kever. Via de gemaakte opening kunnen secundaire schimmels de koffietak aantasten. Deze aantasting, samen met de mechanische schade, heeft in vele gevallen afsterving van de takken tot gevolg.

Het onderzoek over de levenswijze van *X. morstatti* vormt een onderdeel van een studie betreffende het voedselkeuze-mechanisme van dit insect.

Een methode voor het kweken van *X. morstatti* in het laboratorium wordt gegeven. De kever is bestudeerd aan de hand van waarnemingen in veld en laboratorium (tabel 1). Als gevolg van het niet meer aanwezig zijn van de Ambrosia in de oudere gangen ontstaat een sterke spreiding in de ontwikkeling van de larven. Er is een verband tussen de afmetingen van de gangen en de grootte van de nakomelingschap. Een klein deel van de gangen bevat uitsluitend mannelijke nakomelingen.

REFERENCES

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