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SHORT COMMUNICATION

Observations on the links between the architecture of a tree (*Dicorynia guianensis* Amshoff) and Cerambycidae activity in French Guiana

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The development of a given species in a natural forest depends on a multitude of factors. Insects are one of the factors that have an important impact. We would like to present initial observations about the behaviour of longicorns of the Onciderini tribe and their impact on the development of *Dicorynia guianensis*.

A study of the development of *D. guianensis* was conducted in French Guiana (5°18′N, 5°48′W), at the Paracou silvicultural facility. We studied plots where the *Dicorynia* inventory was extended to trees 1 m tall or over. In order to describe the impact of longicorn activity on a *Dicorynia* stand in which spatial distribution is aggregative (Kokou 1992), we chose trees (156 observed trees) in a control plot (plot 11, area: 17 500 m^2). Height, trunk basal diameter and DBH were measured on each tree. A precise morphological description was established for each tree. It was during morphological description that the signs of longicorn attacks were sought. In all the species of the genus *Oncideres*, the female girdles the tree by removing the bark and some of the wood using its mandibles. It then digs deep into the wood above the cut and lays its eggs. The branch then breaks and falls to the ground (Hequet 1996). All that is left

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on the tree is a stump with characteristic signs of insect activity (Figure 1a). When such signs were seen on a plant, the type of structure (trunk, branch) was noted. We also measured the diameter at cut level and the height between the ground and the cut. It was also possible to retrace the history of the tree as the freshly cut parts were all found on the ground next to it. It is worth recalling that longicorn damage can only be identified as such if the damage is relatively recent or relatively well preserved. In fact, under the combined effect of moisture, wood parasites and plant girth increment, the damage rapidly starts to look different or is covered by wood and can no longer be seen from the outside. At this stage, destructive analysis is the only way of identifying the cause of the damage. However, we were unable to carry out such analyses in most cases as wood could not be removed from the experimental control plots. It is also important to bear in mind that once trees grow above a certain height, it is not always possible to check whether the crown has been attacked by longicorns. Our results therefore underestimate the extent of longicorn activity.

The susceptibility of *D. guianensis* trees to longicorn attacks is highly dependent on the stage of development they have reached. Figure 1b shows that overall, few trees within the studied area were affected by longicorns (8%). However, the frequency was much greater (30 to 60%) when considering the trees in the diameter categories between 30 and 80 mm (trees in recruitment phase). The distribution showed also that the largest tree attacked had a trunk diameter of 145 mm but additional observations outside the studied area showed that much larger trees were also attacked by longicorns. In short, over a dbh of some 20 mm, all *D. guianensis* trees are liable to attack by longicorns. A study of the diameter of the affected axes at cut level showed that the diameter of the axes concerned was more variable (Figure 1c). This variability is similar to the effects of longicorn activity of some species of different size observed in the southern United States on *Carya illinoinensis* (Wangenh.) K. Koch (Juglandaceae): females of *Oncideres cingulata* (Say) and *O. rhodosticta* Bates, which are 15 mm long, attack axes between 6 and 13 mm in diameter (Rice 1995, Solomon & Payne 1986), whilst those of *O. pustulatus* LeConte, a larger species (~ 28 mm), attack much thicker axes (18 to 50 mm) (M. E. Rice & B. M. Drees, *pers. comm.*). The fact that the ability of adult longicorns to girdle branches has been seen to depend on their size in various species could provide

Figure 1. (a) Appearance of damage caused by a longicorn on *Dicorynia guianensis*. (b) Histogram of *Dicorynia guianensis* density per basal diameter category (in mm) within the clump. Trees damaged by longicorns (black), undamaged trees (grey). (c) Histogram of densities per diameter category (in mm) of axes damaged by longicorns. (d) Relation between basal diameter (in mm) of damaged trees and the height of longicorn attacks (in cm) for trees inside (●) and outside (○) the clump. (e 1) A tree before and (e 2) after decapitation. (f 1) A tree before and (f 2) after it was severed by longicorns. (g) *Dicorynia* trees damaged by longicorns. x: dead axis; e: epicormic shoot; s: sprout formed after longicorn attack; b: cut branches.

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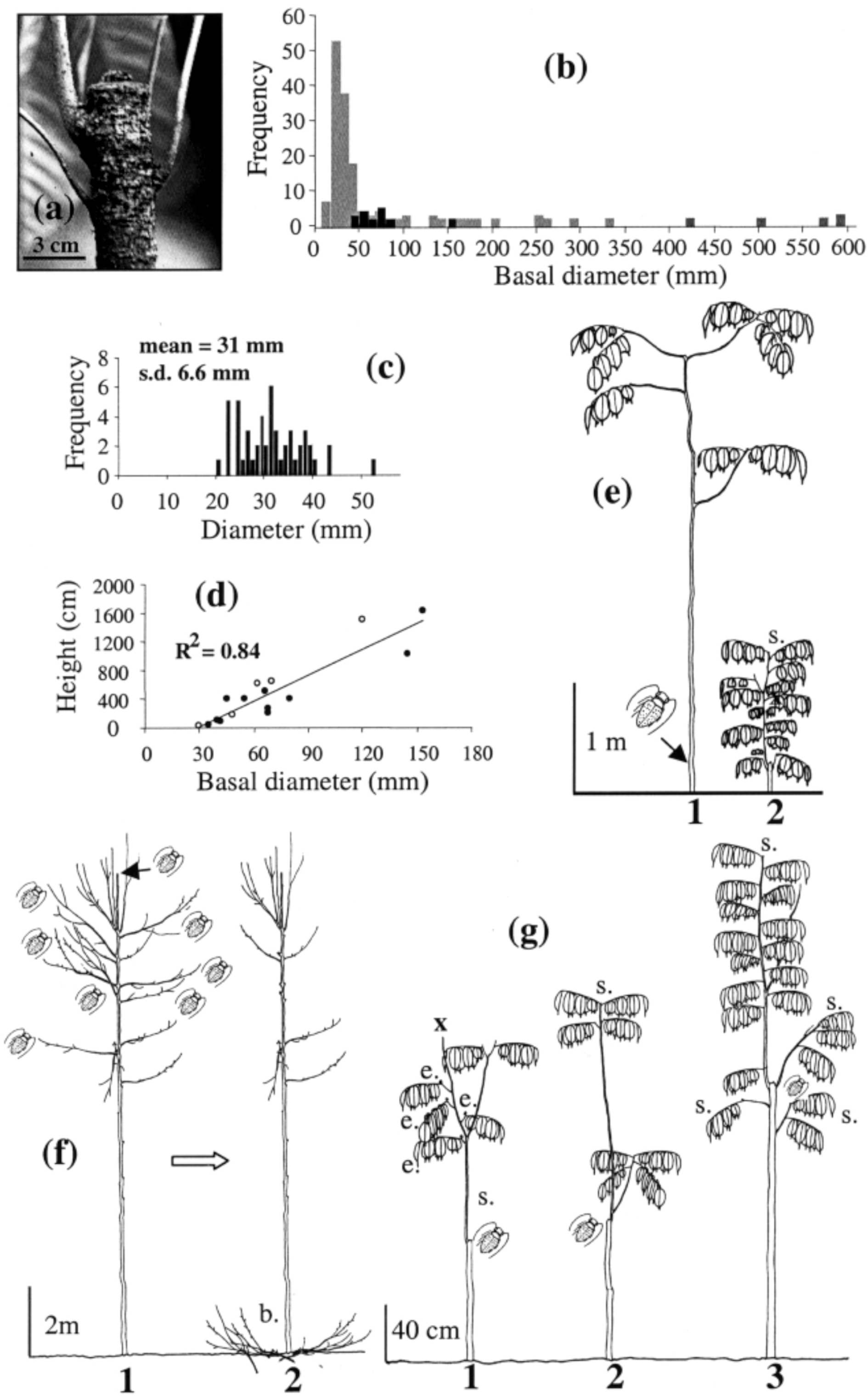

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a model for *D. guianensis*: the attacks on axes between 20 and 52 mm in diameter may be due to *O. chevrolatii* Thomson (~ 30 mm long). Recently a female was captured on a freshly cut *D. guianensis* branch (pers. obs., determination by G. Tavakilian), but this species may also attack other tree species (*Brosimum* sp., Moraceae; Tavakilian *et al.* 1997) and is extremely similar to *O. pustulatus* in terms of size and the axes they attack. The need for longicorns to girdle axes of a certain diameter governs where in the tree they choose to attack. Longicorn attacks were seen at different heights on the trees (Figure 1d). On young trees around 3.5 m tall with a small basal diameter (30 mm), the first part to reach a sufficient diameter is the base of the trunk. This part is also the first to be attacked and the tree was decapitated low down (Figure 1e). Larger trees with thicker trunks were decapitated higher up, but also lost branches (Figure 1f).

Longicorn attacks on *D. guianensis* are not without consequences. Their wide range of attack (23 to 55 mm) means that they can severely damage relatively small trees (Figure 1e), but also trees already well established (Figure 1f). Before being damaged, the trees were part of, or largely dominated the understorey. After the attack, trees could be dominated by the understorey trees and palms which constitute a physical obstacle. We do not really know how the trees are likely to react to these new conditions. However, architectural observations using morphological features (presence or absence of epicormic shoots, internode length, direction of main axis growth) (Durand 1998) suggest that not all trees react to damage in the same way. Some may die (Figure 1g(1)) whilst others manage to thrive (Figure 1g (3)). Longicorn attacks have a variable impact on the future of the damaged trees, depending on the development stage at which the attack occurs, but also on the respective positions of the trees in the stand. The more or less marked consequences of longicorn attacks for the subsequent development of the trees inevitably modify the *D. guianensis* recruitment phase in terms of both duration and quantity and affect the future of the clump expansion in which depends the trees' survival and development. Without suggesting that longicorn damage can prove fatal for *D. guianensis* regeneration, it is essential to take this factor into account.

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