Building behaviour analyzed by X-rays tomography in two subterranean termite species.

E. Darrouzet[1], L. Berville[1], A. Laot[2], M. Legeais[2] & A-G Bagnères[1]

[1] University of Tours, IRBI, Parc de Grandmont, 37200 Tours, France.
[2] CHRU of Tours 2 bd Tonnellé, 37044 Tours, France.
(eric.darrouzet@univ-tours.fr).

3D view of chambers in the wood.

Reticulitermes species are **subterranean termites** which are found in natural and urban area in Europe. Because of their cryptic life, it is difficult to analyze colony sizes and constructions elaborated in soil and/or pieces of wood, i.e., numbers of chambers, structures elaborated in mud inside the wood, etc. By using **X-rays tomography**, a non invasive medical imaging technique, we were able to perform an original study on these different parameters in the lab.
We analyzed **wood consumption strategies** (volumes of wood eaten, kinetic of consumption, how termites colonized the piece of wood) and **building behaviour** by two termite species, *Reticulitermes grassei* and *R. santonensis*.

Materials & methods

- **5 different micro-colonies** are analyzed for each species
- **900 workers/colony** in each plastic box (18 x 12 x 7 cm)
- a piece of wood (pinus: 12 x 4 x 4 cm)
- 2 mm of sand in the bottom

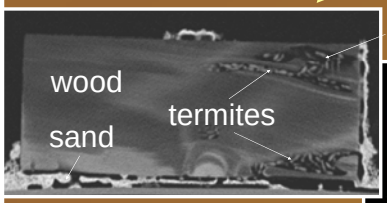
During one year, colonies were analyzed by **X-rays tomography**.

- Parameters : 120 kev, 180 mAs
- Thickness : 0.67 mm
- Increment : 0.33 mm

X-rays tomography

Analyses were performed with a scanner (X-rays tomography).

Data were analyzed with the OsiriX software.

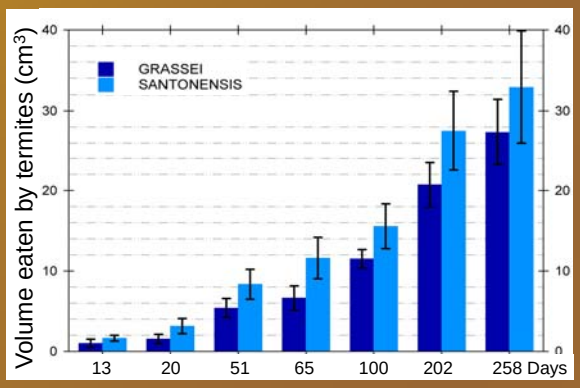


2D view of a piece of wood with chambers containing living termites.

3D view of chambers in the wood.

Piece of wood colonized by termites.

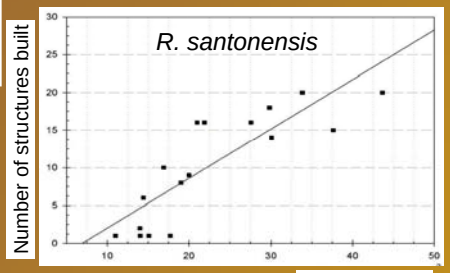
Wood consumption



R. santonensis* consumes more wood than *R. grassei (Mann-Whitney: U=440261, P<0.001) during 258 days.

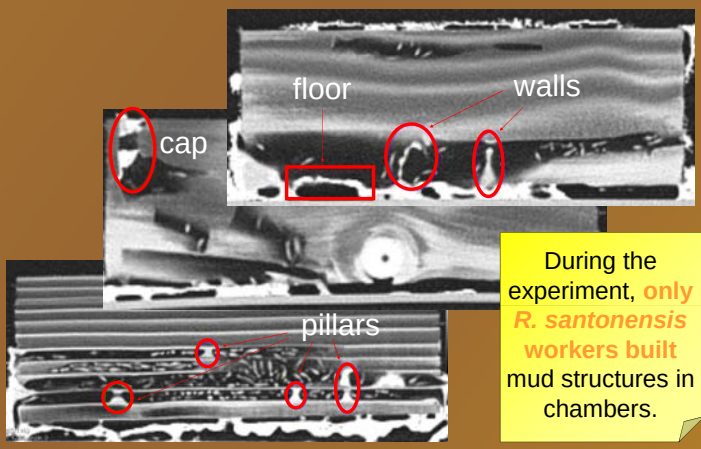
Building behaviour

Worker in action.



The number of structures built in chambers is **correlated** to the volume of wood consumed (Pearson correlation: $r=0.846$, $P=9.88\times10^{-6}$).

Different structures built in the wood



During the experiment, **only *R. santonensis* workers built** mud structures in chambers.

Different mud structures are built inside the chambers in the wood: **caps, pillars, floors and walls.**

CONCLUSION

- X-rays tomography is a fantastic tool to study insects' architectures and building behaviour in continue.
- For the first time, wood consumption and building behaviour of living subterranean termites were observed *in situ* during one year.
- In our conditions, the two species present great behavioural differences, as *R. santonensis* (1) eats more wood than *R. grassei* and (2) is the one who elaborates mud structures inside the wood.
- Our results confirm previous observations than *R. santonensis*, an invasive species introduced in France 300 years ago, makes more damages than *R. grassei*.