ON TERMITES IN CENTRAL AND SOUTH AMERICA*

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RESUMO

Também na América Central e na América do Sul os termites apresentam uma importância econômica na destruição de madeiras. As principais famílias e uma parte das espécies serão mencionadas. Será dado um informe sobre os resultados de pesquisas comparadas sobre a influência da temperatura nas espécies Nasutitermes *e* Coptotermes *da região.*

Cryptotermes brevis *(Walker) sobreviveu e desenvolveu-se em Berlin (ocidental) num museu sob condiçõese muito desfavoráveis de temperatura, umidade e nutrição. Colônias indesejáveis de termites desenvolveram-se até em 20°C.*

1. INTRODUCTION

Termites are of high economic importance as wood destroyers in all tropical and subtropical areas. Their significance also for Central and South America is well known. The lists of species in the area published by S. F. LIGHT (1946), T. E. SNYDER (1946, 1949), E. E. SNYDER AND J. ZETEK (1946)), W. V. HARRIS (1971) provide information. The publication of ARAUJO (1970) contains a comprehensive description of distribution, biology, ecology e and other aspects and a review of the literature. Special information on termites in Brazil is contained in publications of A. M. DA COSTA LIMA (1936, 1939, 1941, 1942) and R. L. ARAUJO (1958 a, b, 1961). The intention of my report is to give a brief survey on the main wood-destroying species of this pest on the American continent, to compare the group of important species with the situation in other parts of the world and to contribute to the knowledge of some of the species. Termites as agricultural and forestry pests shall not be dealt with in this paper.

2. WOOD-DESTROYING SPECIES OF ECONOMIC IMPORTANCE

The common division of termites according to biological and practical aspects into drywood termites, subterranean termites and carton nest-building termites is useful.

The drywood termites are widely distributed and present a great hazard especially in Central America. The main genus is **Cryptotermes**, the most common and most important species **Cryptotermes brevis** (Walker). While most **Cryptotermes** and other drywood species are more or less restricted to coastal areas with high relative humidity, **C. brevis** is also distributed in the interior of the country. In Guatemala I found this species up to elevations of about 2,300 m far from the coast. In the interior of Mexico, too, the species is widespread. In Brazil it is recorded for the States of São Paulo, Guanabara, Espírito Santo and Minas Gerais (R. L. ARAUJO 1958a, 1970); the termites destroy predominantly wood in man-made structures.

In coastal areas **Cryptotermes cavifrons** Banks, **C. domesticus** (Haviland), **C. dudleyi** Banks and **C. havilandi** (Sjöstedt), which were introduced from other continents, are found, the two latter also in Rio de Janeiro.

Incisistermes, Kalotermes and **Marginitermes** are further drywood termites of economic importance. Mainly neotropical are the Kalotermitidae genera **Calcaritermes** and **Rugitermes.** Both are represented in the area by 12 species each. **Rugitermes** is distributed from Guatemala — where I found in 1951 the most northern one, namely **R. unicolor** Snyder — to Argentina. Part of the species destroy timber in buldings or posts. Also the **Neotermes** species which need a higher humidity than other Kalotermitidae are of limited economic importance. As regards Brazil, **Calaritermes** and

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Eucryptotermes species are found in the Southeast; **Neotermes castaneus** (Burmeister) and **N. wagneri** (Desneux) were observed in dead wood of standing trees (A. M. da COSTA LIMA 1942, R. L. ARAUJO 1970).

The family **Rhinotermitidae** contains several important genera of subterranean termites. **Heterotermes** with very small-sized individuals is represented by several species, the most important of which are **H. tenuis** Hagen and **H. convexinotatus** Snyder in Central America and the first also in northern parts of South America. In northern Mexico **H. aureus** (Snyder) occurs, in other parts of the country other species (S. F. LIGHT 1946). Especially **H. tenuis** and **H. convexinotatus** can destroy timber in buildings, also in upper parts, poles and even cable material. In Brazil **H. tenuis** seems to be restricted to culture land and savannahs (R. L. ARAUJO 1970).

Coptorermes crassus Snyder, **C. niger** Snyder and **C. testaceus** (L.) are common in many parts of Central America and the first also in South America. **C. niger** has been found attacking the rotten heartwood of standing trees of **Pinus caribeae** (R. M. C. WILLIAMS 1965) in British Honduras (Belize) and of **Liriodendron** and **Swietenia** species (R. L. ARAUJO 1970) and of various other hardwood species in Colombia (G. BECKER 1972). The **Coptotermes** species may attack poles and posts and timber in buildings. Heavy infestations and serious timber deterioration of many buildings up to the fourth floors in some cases up to the 17th floor in the State of São Paulo (Brazil) have been reported by M. SOARES CAVALCANTI (1976); the **Coptotermes** species has not yet been determined at that time. Recently (A. TADEU DE LELIS 1978) **Coptotermes havilandi** Holmgren form West Africa was identified which was collected already in Rio de Janeiro in 1923 and in Santos in 1934 (A. M. DA COSTA LIMA 1936). The species became established in some places of Central America too. In Brazil it attacked also paper, textiles, leather and polyurethane foams and furthermore standing trees (A. TADEU DE LELIS 1978).

In the northern parts of Mexico **Reticulitermes** species are wood destroyers like in the United States of America. This genus is confined to subtropical areas.

In the tropical parts of Central America **Prorhinotermes simplex** (Hagen) may destroy wood under wet condition.

The most highly developed termites of the family **Termitidae** have many species also in the neotropical region, and part of them are of great economic importance as wood destroyers. Most characteristic is the predominance of the carton nest-building **Nasutitermes** species and their deterioration of timber and other materials. This genus is represented by many species also in other tropical areas. In Africa and South Asia, however, **Nasutitermes** species are no significant destroyers of wood used by man. This is the case in Australia and to a great extent in Central America and northern parts of South America. Species concerned are **N. corniger** (Motschulski) **N. costalis** (Hollmgren), **N. columbicus** (Holmgren), **N. ephratae** (Holmgren), **N. Nigriceps** (Haldeman) and many other species of more limited distribution. Already long time ago (T. E. SNYDER and J. ZETEK 1941) **N. ephratae** was reported to attack underground cable covers. In rurla especially in forestry areas, **Nasutitermes** species destroy a lot of timber in buildings, fences, poles etc. In the laboratory species from Central and South America are more vigorus and active than species from Africa and South Asia.

Further genera of **Termitidae** which may destroy wood used by man are **Amitermes, Procornitermes** and to a lesser extent **Cornitermes, Termes, Constrictotermes** (M. SOARES CAVALCANTE 1976 b) and **Microcerotermes.** The nests of **Amitermes** and **Cornitermes** species which may be large mounds influence the landscape in Brazil and other countries of South America (R. L. ARAUJO 1970). The carton nests of **Termes** are flat and not as spectacular, their material is harder than that of **Nasutitermes** species. **Microcerotermes** has also carton nests which are found in the neotropics on trees or on trunks; their gal-

leries on the bark connect them with the soil. These galleries are smaller than the runways of **Nasutitermes** species.

Macrotermitidae which build large and spectacular mounds of soil and destroy wood intensively, also in buildings on other continents are not represented in the neotropical region. This is one of the characteristic differences between Central and South America and Africa, South Asia and Australia.

3. ON THE BIOLOGY AND ECOLOGY OF SOME TERMITE SPECIES

Some contributions to the knowledge of the biology and ecology of a few neotropical termite species were made in the laboratory in Berlin-Dahlem.

A comparative study was made of the dependence of the development of incipient colonies and of wood consumption of groups of workers and larvae with soldiers on various temperatures using **Nasutitermes ephratae** (Holmgren) and **N. nigriceps** (Haldeman). Both species are thermophilous. The optimal temperature for the fastest development of incipient colonies was about 29°C with **N. ephratae** (G. BECKER 1961) and about 30°C with **N. nigriceps** (M. GARCIA and G. BECKER 1975). **N. nigriceps** is better adapted to higher temperatures than **N. ephratae.** The maximum of wood consumption was observed at 32°C with **N. ephratae** (G. BECKER 1967 and at nearly 33°C with **N. nigriceps** (G. BECKER 1978). The optimum is about one degree C higher for **N. nigriceps** than for **N. ephratae.** I colected the colony of **N. ephratae** in Mexico near Alvarado (Veracruz) which was the first finding of this species for Mexico ;the **N. nigriceps** colony came from the valley of Esquintla in western Guatemala. **N. nigriceps** build their nests in Guatemala and other countries also at high elevations on trees where they are exposed to sunshine and heat, while **N. ephratae** prefer lower locations and shade for their nests. In the Rio Magdalena rain forest area in Colombia it was evident that the nests of **N. ephratae** were built in the shade while **Nasutitermes columbicus** (Holmgren) with an easily distinguishable different structure of the surface of nests construct them frequently in full sunshine (G. BECKER (1972). These are examples of ecological differences between species of the same genus.

Another difference is worthwile mentioning. The **Nasutitermes** species dislike coniferous wood. While **N. ephratae** does not attack pine wood even in case of starvation, **N. nigriceps** destroys also pine. The reason for this difference is not yet known.

Differences in the reaction to temperature have also been observed with species of **Coptotermes.** Wood consuption at various temperatures was studied comparatively with **C. amanii** (Sjöstedt from Kenya, East Africa (G. BECKER 1966, 1967), **C. formosanus** (Shiraki) from the state of Louisiana — (USA) and **C. niger** Snyder from British Honduras — Belize (G. BECKER 1978). The optimal temperature is highest at 30 to 32°C with **C. formosanus** and lowest at 28 to 29°C with **C. niger** from Central America. This species was found to live in the decayed interior of old standing trees of **Pinus caribaea** Morelot in Central America (R. M. C. WILLIAMS 1965) and of various hardwood species in Colombia (G. BECKER 1972). In the interior of large trees the temperature is more constant and not sometimes very high like in other places. It would be interesting to investigate whether **Coptotermes crassus** Snyder which is common in Central America and the north of South America has a different temperature optimum. In the laboratory in Berlin-Dahlem at 30°C and 28°C the individuals of the cultures of **C. formosanus** are much more active and vigorous than of the cultures of **C. niger** which have now been kept for more than 14 years.

The drywood species **Cryptotermes brevis** (Walker) is of highest economic importance in Central and South America. It has been establihsed also on other continents, e.g. in Hawaii, in China and in places of the coasts of Africa. I found it in Kinshasa (Zaire) in 1962. R. M. C. WILLIAMS (1976, 1977) demonstrated that **C. brevis** compared with other **Cryptotermes** species showed some remarka-

ble differences in their reaction to ecological conditions of humidity and temperature and it is therefore probably of such an outstanding importance. Recently it has been found in Berlin (West) where it survived in calabash material from the Chiapas state in Mexico for more than 7 years in Germany and for more than 5 years in a collection room of a museum in Berlin-Dahlem in the basement at temperatures between 18 and 22°C and under dry conditions at a relative humidity of 50 — 60%. The species attacked the sapwood parts of pine boards in the collection room which is not a very convenient food for this species and produced many alates the swarming of which led to the detection of the infestation (G. BECKER and U. KNY 1977). At the same time another infestation of furniture bought in Hawaii 7 years before and kept in a private home in Berlin for 3 years became known. These cases, especially the long survival period and the development under dry conditions in the museum demonstrate that **Cryptotermes brevis** is a very tolerant species.

Apart from the high tolerance to dry conditions for long periods the species can also live and develop at low temperatures, as the example of the museum in Berlin has demonstrated. In Central America it lives also at high elevations in the mountains, as mentioned before. Pairs of dealated imagines from the museum in Berlin-Dahlem were kept at various temperatures of 2° C difference between 20°C and 30°C. After 6 months the incipient colonies were investigated. Even at 20°C the **Cryptotermes brevis** imagines laid eggs and larvae developed. Surprisingly the average number of larvae and eggs was not smaller than at 22, 24 and 30°C. Other tropical termite species do not survive at 20°C and **Cryptotermes dudleyi** from Kenya revealed the highest wood consumption at 30 to 31°C (G. BECKER 1967). The high ecological tolerance makes **Cryptotermes brevis** very dangerous as wood destroyer under different conditions.

The optimal temperature for wood consumption in laboratory tests after culturing the species at 28°C was approx. 30°C for **Neotermes castaneus** (Burmeister) and **N. jouteli** (Banks), 29 to 30°C for **Prorhinotermes simplex** (Hagen) and about 29°C for **Incisitermes tabogae** (Snyder), all from Central America (G. BECKER 1978).

More research on biology and ecology of neotropical termites would be useful.

3. SUMMARY

Termites are of high economic importance as wood destroyers also in Central and South America. The most significant genera and part of the species are mentioned. Results of some comparative investigations on the influence of temperatures on **Nasutitermes** and **Coptotermes** species of the area are recorded. **Cryptotermes brevis** (Walker) developed in Berlin (West) in a museum under very unfavourable conditions of temperature, humidity and food; incipient colonies of swarming alates developed even at 20°C.

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