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# Termites in Eastern Canada: An Updated Review and Bibliography

by

J. Kenneth Grace

Faculty of Forestry
Earth Sciences Centre
33 Willcocks Street
University of Toronto
Toronto, Ontario M5S 3B3
Canada

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**J. Kenneth Grace**[1]

**Faculty of Forestry, Earth Sciences Centre, 33 Willcocks Street, University of Toronto, Toronto, Ontario M5S 3B3, Canada**

## ABSTRACT

This report updates Document No. IRG/WP/1333, issued in 1987. The current distribution of termites in eastern Canada and current termite control practices and controversies are explained, and current research is very briefly summarized. Since 1987, *Reticulitermes flavipes* (Kollar) (Isoptera: Rhinotermitidae) has been discovered in several more municipalities in the province of Ontario, and in Winnipeg, Manitoba. In October 1989, a well-established drywood termite (Isoptera: Kalotermitidae) infestation was also found in the framing of one house in Toronto. Restrictions on soil pesticide applications for subterranean termite control have increased since 1987, and research on termite biology and control has progressed at the University of Toronto. A comprehensive bibliography of publications, technical reports, and theses concerned with termites in eastern Canada is included in this report.

**KEYWORDS:** *Reticulitermes*, termite distribution, termite control, Rhinotermitidae, Isoptera

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## INTRODUCTION

This paper is intended as an update to the review of Canadian termites delivered to the eighteenth annual meeting of the International Research Group on Wood Preservation (Grace 1987). Termite distribution has increased since that time, and a number of new reports have been issued. Rather than review research in detail, a comprehensive bibliography has been included. This bibliography includes reports of limited distribution that (since the apparent demise of the journal *Termite Abstracts*) might otherwise be little known outside of the University or government agency issuing them. In addition to the author, sources of these materials are: (1) Faculty of Forestry, Earth Sciences Centre, 33 Willcocks St., University of Toronto, Toronto, Ontario M5S 3B3; (2) Policy and Programs Division, City of Toronto Department of Housing, 112 Elizabeth St., Toronto, Ontario M5G 1P5; (3) Hazardous Contaminants Coordination Branch, Ontario Ministry of the Environment, 135 St. Clair Ave. West, Toronto, Ontario M4V 1P5, Canada.

## TERMITE DISTRIBUTION

The eastern subterranean termite, *Reticulitermes flavipes* (Kollar) (Isoptera: Rhinotermitidae), was first reported in the province of Ontario from Point Pelee (41°57'N, 82°31'W) in 1929 (Kirby 1965), was apparently introduced to Toronto (43°42'N, 79°25'W) by ship from the United States about 1935 (Urquhart 1953), and has now been reported in 30 municipalities in the province. The northernmost site of established termite infestation in the province remains the Town of Kincardine (44°11'N, 81°38'W), and

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[1]*Current address:* **Department of Entomology, 3050 Maile Way, Room 310, University of Hawaii, Honolulu, Hawaii 96822, USA.**

in 1988 *R. flavipes* was found in a new area of that town (a downtown building). Also in 1988, termite infestation was found in several homes in the Town of Pickering, east of Toronto. In 1989, *R. flavipes* was found in several buildings, railroad ties and scrap lumber over a large industrial-commercial site in the City of Kitchener (unpublished observations).

The discovery of subterranean termites in homes and yards on one side of one block in the City of Winnipeg, Manitoba, in August 1987 (Anonymous 1989; R.A. Ellis, pers. commun.), indicates the potential for further northern distribution and survival of termites in cold habitats. Alate flights are rare in northern habitats (Esenther 1969), and subterranean termites appear to spread primarily by movement of infested wood. However, several alate swarms were observed in Toronto from the second week of May through the first week of June 1989 (unpublished observations, described in *Termite Tips* No. 2 - July 1989 [see Grace 1989-90]).

An active and well established infestation of drywood termites (Isoptera: Kalotermitidae) was also discovered in one home in Toronto in October 1989 (unpublished observations, described in *Termite Tips* No. 4 - January 1990 [see Grace 1989-90]). From the extent of the infestation in wall and floor framing, it appears that these termites have been present for quite a few years, with alate flights in 1988 and 1989. However, inspection of adjacent buildings did not reveal any evidence of infestation. It is hoped that fumigation of the building this spring will end the risk of a second hazardous termite species spreading throughout Ontario.

## TERMITE CONTROL

Subterranean termites are currently controlled in Ontario by (1) removing any contacts between wood structural members and the soil, and (2) injection of pesticides into the soil (rod-treatment, as opposed to broadcast surface sprays or trenching) on either side of foundation footings and into voids in the foundation walls. The organochlorines aldrin, chlordane and dieldrin are registered for this use in Canada, although only aldrin remains in ready supply in Ontario. None of these pesticides are currently manufactured in North America nor imported into Canada. The organophosphate chlorpyrifos (Dursban TC, Dow Chemical Canada Inc.) is the only other termiticide available in Canada for soil treatment (currently with a temporary label). Chlorpyrifos was applied to the infested properties in Winnipeg in the summer of 1989 (Anonymous 1989; D. Lanteigne, pers. commun.). Concerns over possible adverse affects of organochlorine use on public health led to a policy statement by the Ontario Ministry of the Environment in September 1989 in which "the Ministry of the Environment urges municipalities to use chlorpyrifos as the termiticide product of choice" and recommendations by City of Toronto agencies to further restrict or ban the use of organochlorine termiticides (City Council 1989; Neighbourhoods Committee 1989). Restricting aldrin to exterior use only is one alternative currently under discussion within the Ministry of the Environment.

In fall 1989, the Ontario Ministry of the Environment announced that the provincial program of grants to property owners to offset the cost of termiticide soil treatments would not be continued in 1990. Currently, this program has been terminated, although other provincial ministries are now discussing the possibility of administering a similar grant program.

## RECENT RESEARCH

Research on subterranean termite biology and control since January 1987 at the Faculty of Forestry, University of Toronto, has been financially supported by the Canada Mortgage & Housing Corp., Ontario Ministry of the Environment, Ontario Ministry of Housing, Ontario Real Estate Association Foundation, Toronto Real Estate Board, George C. Metcalf Foundation, US Borax Corp., and the municipalities of

East York, Etobicoke, Dresden, Guelph, Hamilton, Kincardine, Leamington, North York, Oakville, Scarborough, and Toronto. Research support by municipal governments is fairly unique, and might be worth exploring elsewhere.

Mark-release-recapture studies in 1988 and 1989 (Grace *et al.* 1989; Grace 1990*b*) with dye-marked termites established that *R. flavipes* colonies have foraging populations in the millions moving over very large territories (over 1,000 square meters at one site). This supports the use of baits for subterranean termite control since bait placement should be less critical than would be the case with isolated small colonies, and a few baits could affect the termite population over a large area.

Methods are needed to observe subterranean termite colony activities during the winter months. There is no foraging activity at the soil surface, and the 15-cm deep "termite traps" (plastic pipe containing corrugated cardboard) used for warm-weather monitoring (Grace 1989*a*) are not useful in the winter. If cold weather forces aggregation of colony members into certain portions of the foraging territory, than winter bait placement might be an effective approach to control.

Laboratory evaluations have focused on borates as potential bait toxicants or as termiticidal dusts to be applied in a toxic variation of mark-release-recapture methodology. Several potential fungal pathogens have also been isolated from *R. flavipes* field collections, including a *Beauveria bassiana* isolate (Zoberi & Grace 1990*a*, 1990*b*), and are under evaluation for use in baits. Efforts to use antioxidants to prolong the life of attractive fungal semiochemicals (extracts of *Gloeophyllum trabeum*) to enhance feeding on baits or termite orientation to them have not yet met with success, but work with extractives of a "preferred" (*Aesculus hippocastanum*) and "non-preferred" (*Ailanthus altissima*) tree species suggest that positive and negative orientation responses are important in explaining termite food preferences (Grace 1990*a*).

Also at the University of Toronto, Prof. M. Hubbes and D. Trudeau are evaluating different nematode strains for termite control (Trudeau 1990). The only current research on termites in eastern Canada outside of the University has been the establishment in 1988 of a field test plot in Kincardine, Ontario, for evaluating the performance of treated wood. With industry sponsorship, this test plot is maintained by the Eastern Division of Forintek Canada (Doyle 1990).

## REFERENCES AND BIBLIOGRAPHY

***Journals & Proceedings:***


Anonymous. 1989. Termites take residence in Winnipeg. *Pest Management* 8(11): 16.

Beal, R.H., & G.R. Esenther. 1980. A new approach to subterranean termite control - the bait block method. *Sociobiology* 5: 171-174.

Carr, R.V. 1984 [issued 1987]. Termite control in Toronto: The first integrated urban pest management program on a municipal scale. *Proceedings of the Canadian Wood Preservation Association* 5: 68-72.

Cutten, G.M. 1984 [issued 1987]. A comprehensive Ontario termite control program. *Proceedings of the Canadian Wood Preservation Association* 5: 84-104.

Cooper, P.A. 1984 [issued 1987]. Investigation of subterranean termite activity in trees in Toronto, Ontario. *Proceedings of the Canadian Wood Preservation Association* 5: 60-61.

Cooper, P.A., & J.K. Grace. 1987. Association of the eastern subterranean termite, *Reticulitermes flavipes* (Kollar), with living trees in Canada. *Journal of Entomological Science* 22(4): 353-354.

Esenther, G.R. 1969. Termites in Wisconsin. *Annals of the Entomological Society of America* 62: 1274-1284.

Esenther, G.R. 1980. Estimating the size of subterranean termite colonies by a release-recapture technique. *The International Research Group on Wood Preservation* Document No. IRG/WP/1112. 5 pp.
Esenther, G.R., & R.H. Beal. 1979. Termite control: Decayed wood bait. *Sociobiology* 4: 215-222.
Esenther, G.R., & D.E. Gray. 1968. Subterranean termite studies in southern Ontario. *Canadian Entomologist* 100: 827-834.
Grace, J.K. 1987*a*. Termites in eastern Canada: A brief review and assessment. *The International Research Group on Wood Preservation* Document No: IRG/WP/1333. 6 pp.
Grace, J.K. 1987*b*. The challenge of wood destroying insects. *Proceedings of the Canadian Wood Preservation Association* 7: 3-12.
Grace, J.K. 1988*a*. Toxicity and Repellency of the Fungicide TCMTB to the Eastern Subterranean Termite (Isoptera: Rhinotermitidae). *Proceedings of the Entomological Society of Ontario* 119: 83-85.
Grace, J.K. 1988*b*. Update on eastern subterranean termites. *Proceedings of the Canadian Wood Preservation Association* 9: 56-57.
Grace, J.K. 1989*a*. A modified trap technique for monitoring *Reticulitermes* subterranean termites (Isoptera: Rhinotermitidae). *Pan-Pacific Entomologist* 65: 381-384.
Grace, J.K. 1989*b*. Habituation in termite orientation response to fungal semiochemicals. *Sociobiology* 16(2): 175-182.
Grace, J.K. 1989*c*. Northern subterranean termites. *Pest Management* 8(11): 14-16.
Grace, J.K. 1990*a*. Behavioral ecology of subterranean termites and implications for control. *In* Proceedings of a Symposium on Current Research on Wood Destroying Organisms and Future Prospects for Protecting Wood in Use (M.I. Haverty & W.W. Wilcox, eds.). [In press]
Grace, J.K. 1990*b*. Mark-recapture studies with *Reticulitermes flavipes* (Isoptera: Rhinotermitidae). *Sociobiology*. [In press]
Grace, J.K. 1990*c*. Oral toxicity of barium metaborate to the eastern subterranean termite (Isoptera: Rhinotermitidae). *Journal of Entomological Science* 25(1): [In press].
Grace, J.K., & A. Abdallay. 1989. Evaluation of the dye marker Sudan Red 7B with *Reticulitermes flavipes* (Isoptera: Rhinotermitidae). *Sociobiology* 15(1): 71-77.
Grace, J.K., & A. Abdallay. 1990*a*. A short-term dye for marking eastern subterranean termites (*Reticulitermes flavipes* Koll., Isoptera, Rhinotermitidae). *Journal of Applied Entomology* 109(1): 71-75.
Grace, J.K., & A. Abdallay. 1990*b*. Termiticidal activity of boron dusts (Isoptera, Rhinotermitidae). *Journal of Applied Entomology*. [In press]
Grace, J.K., A. Abdallay, & K.R. Farr. 1989. Eastern subterranean termite (Isoptera: Rhinotermitidae) foraging territories and populations in Toronto. *Canadian Entomologist* 121: 551-556.
Grace, J.K., & G.M. Cutten. 1990. Public perceptions of termite control practices in several Ontario (Canada) municipalities. *Journal of Environmental Management*. [In press]
Kirby, C.S. 1965. The distribution of termites in Ontario after 25 years. *Canadian Entomologist* 97: 310-314.
Ostaff, D., & D.E. Gray. 1975. Termite (Isoptera) suppression with toxic baits. *Canadian Entomologist* 107: 1321-1325.
Urquhart, F.A. 1953. The introduction of the termite into Ontario. *Canadian Entomologist* 85: 292-293.
Urquhart, F.A. 1954. A new locality record for the termite in Ontario. *Canadian Entomologist* 86: 576.
Vickery, V.R., & G.G.E. Scudder. 1987. The Canadian Orthopteroid insects summarized and updated, including a tabular check-list and ecological notes. *Proceedings of the Entomological Society of Ontario* 118: 25-45.
Zoberi, M.H., & J.K. Grace. 1990*a*. Fungi associated with the subterranean termite *Reticulitermes flavipes* (Kollar) in Ontario. *Mycologia*. [In press]
Zoberi, M.H., & J.K. Grace. 1990*b*. Isolation of the pathogen *Beauveria bassiana* from *Reticulitermes flavipes* (Isoptera: Rhinotermitidae). *Sociobiology*. [In press]

***Technical Reports (Limited Distribution):***

Anonymous. Undated. Termites: Pest Control Information. Ontario Ministry of the Environment. 8 pp.

Blackhall, T.N. 1981. Termites and Carpenter Ants. National Research Council of Canada, Division of Building Research. Building Practice Note No. 22. 15 pp.

Chenier, R.V. 1983. Selection of Biocides to Control Termites and Other Wood Boring Insects. Report prepared for Canadian Forestry Service Project No. 14. Forintek Canada Corp., Eastern Laboratory, Ottawa. 12 pp.

City Council. 1989*a*. Use of Termiticides: Report of Meeting 5 October 1989. City of Toronto Reference No. 89nhc 15-18A:51.

City Council. 1989*b*. Use of Termiticides: Report of Meeting 12 October 1989. City of Toronto Reference No. c38nhc89054:306.

Cooper, P.A. 1981. The Subterranean Termite (*Reticulitermes flavipes*) - Its Activity and Control in Shade Trees. Final Report to the Ontario Shade Tree Council. 25 pp.

Cooper, P.A., & R. Morris. 1981. Rationalization of Research and Policies for Control of the Eastern Subterranean Termite. Final Report to Canada Mortgage & Housing Corporation. 85 pp.

Cutten, G.M. 1988. Termite Control in Ontario. Ontario Ministry of the Environment, Toronto. 85 pp.

Doyle, E.E. 1990. Termites and pressure treated wood. *Termite Tips* No. 4. [See Grace 1989-90.]

Faculty of Forestry. 1986 [revised]. Development of an Integrated Control Program for the Control of the Eastern Subterranean Termite in the Urban Environment. Research Proposal, Faculty of Forestry, University of Toronto.

Grace, J.K. 1987. Development of an Integrated Control Program for the Eastern Subterranean Termite: Interim Report, January - August 1987. Faculty of Forestry, University of Toronto. 74 pp.

Grace, J.K. 1987. Development of an Integrated Control Program for the Eastern Subterranean Termite: Annual Report, January - December 1987. Faculty of Forestry, University of Toronto. 22 pp.

Grace, J.K. 1988. Development of an Integrated Control Program for the Eastern Subterranean Termite: Annual Report, 1 January - 31 December 1988. Faculty of Forestry, University of Toronto. 44 pp.

Grace, J.K. 1990. Development of an Integrated Control Program for the Eastern Subterranean Termite: Annual Report, 1 January - 31 December 1989. Faculty of Forestry, University of Toronto. 73 pp.

Grace, J.K. 1989-90. *Termite Tips*. [Newsletter for structural pest control professionals.] Faculty of Forestry, University of Toronto. No. 1 (April 1989) - No. 4 (January 1990).

Grace, J.K., J. Iriah, & M.H. Zoberi. 1989. Evaluation of the use of termite attractants to synergize soil pesticide applications in structural pest control. Pp. 64-66 *in* Research Projects Funded by the Ministry of the Environment Through the Ontario Pesticides Advisory Committee 1988-1989. Ontario Ministry of the Environment. ISSN 8030-0267.

Jafri, A. 1983*a*. Termites in Toronto: A Review and Evaluation of Toronto's Termite Control Program. City of Toronto Planning and Development Department. 112 pp.

Jafri, A. 1983*b*. The Edible City. City of Toronto Planning and Development Department, Research Bulletin 21. 8 pp.

Jafri, A. 1985-88. Termite Monitor: Termite and Carpenter Ant Control. City of Toronto Planning and Development Department. [Series of four annual reports - continued in 1989 under the title *Termite Report*.]

Jafri, A. 1989. Termite Report 1989: Termite and Carpenter Ant Control. City of Toronto Housing Department. 50 pp. [Continuation of the *Termite Monitor* series.]

Kirby, C.S. 1967. Termites in Ontario, with particular reference to the Toronto region. Canadian Department of Forestry and Rural Development Forestry Branch, Forest Research Laboratory Information Report 0-X-56. 30 pp. [Reprint from Information Report 1963-1, dated April 1963.]

Neighbourhoods Committee. 1989. Use of Termiticides. City of Toronto Neighbourhoods Committee Report No. 15, City of Toronto Reference No. c34exec89047:526.

*Theses:*

Husby, W.D. 1980. Biological Studies on *Reticulitermes flavipes* (Kollar) (Dictuoptera, Rhinotermitidae) in Southern Ontario. M.Sc. thesis, Department of Environmental Biology, University of Guelph. 154 pp.

Keefer, D.L. 1979. The Termite Problem in Southern Ontario. Undergraduate thesis, Faculty of Forestry, University of Toronto. 62 pp.

Trudeau, D. 1990. Selection of Entomophilic Nematodes for Control of the Eastern Subterranean Termite, *Reticulitermes flavipes* (Kollar) (Isoptera: Rhinotermitidae). M.Sc.F. thesis, Faculty of Forestry, University of Toronto. 93 pp.