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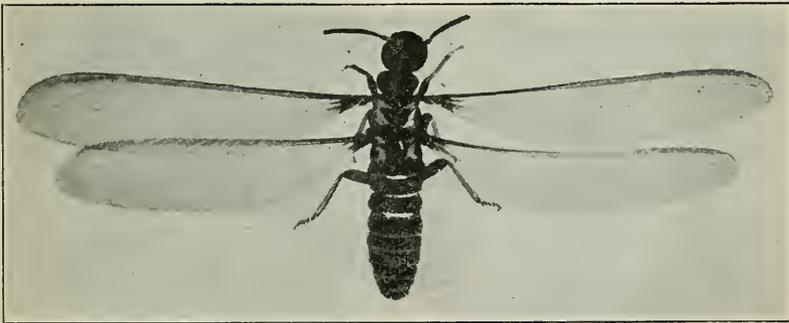
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HABITS AND CONTROL OF TERMITES

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BY AUGUST E. MILLER
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MATURE WINGED TERMITE
(35 times actual size)

URBANA, ILLINOIS
1928

STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION

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HABITS AND CONTROL OF TERMITES

BY AUGUST E. MILLER

In view of the increasing number of requests from residents in various parts of the State for information concerning the activities of termites, it seems desirable to present this account of their habits and the measures of suppression thus far found to be most effective. An attempt has been made to formulate rather definite questions which might arise concerning a termite outbreak, and to present answers which would be free of encumbering detail.



Fig. 1.—ADULT WORKER
(65 times natural size)

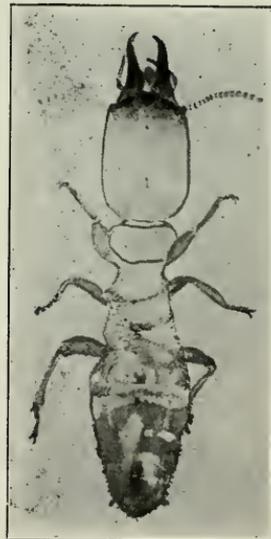


Fig. 2.—ADULT SOLDIER
(65 times natural size)

1. **What are termites?** Generally speaking, termites are insects of a rather primitive type, altho they maintain a rather highly perfected social organization, living in colonies made up of several classes—workers, soldiers, and sexual forms.

The workers (Fig. 1) are milky-white to gray, slightly flattened insects, about one-fifth inch long, without wings and with cutting

mouth parts. They are usually the most numerous individuals in a colony.

The soldiers (Fig. 2) are of about the same shape and size as the workers and have no wings. They have a yellowish abdomen and large reddish-brown head with strong pincher-like jaws.

There are three sexual forms. Males and virgin females of the first form (Fig. 3) are black, faintly tinged with brown, of the same general shape and size as the workers, and have four long silvery wings which give them a length of about one-half inch. Fertile females, or queens, are of the same color as virgins, but with bands of white across the abdomen in the older ones; the body is variously distended with eggs, and the wings have been broken off at a definite joint near the base. The latter individuals are but rarely seen.

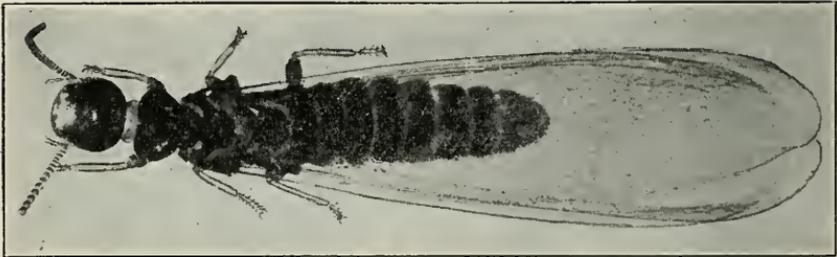


Fig. 3.—ADULT OF FIRST SEXUAL FORM WITH WINGS FOLDED
(60 times natural size)

Males and females of the second and third forms never develop wings with which to fly, nor are they black. The second form is quite common in Illinois. These queens, likewise, become quite large.

Of the three species of termites occurring in Illinois, reference is here made only to the commonest one, *Reticulitermes flavipes* Kollar.

2. What damage is done by termites? Termites eat all manner of wooden structures and materials which are favorably exposed to their attack and unprotected. They work their way upward from the ground into the walls of houses, barns and other buildings, weakening the floors and their supports, so that the infested buildings ultimately become unsafe for use. The pests even burrow into tables, chairs, bookcases, and other heavy pieces of furniture to which they have access. They also work havoc with fence posts, telephone and telegraph poles, railroad ties, lumber yards, and warehouses; and they frequently attack living plants. Conservatively estimated, the property loss caused by termites in Illinois amounts to \$5,000,000 a year.

3. Do these insects occur everywhere? Although not every property in every town in the State is infested, it seems safe to say that practically every community with the exception of those in Jo Daviess, Stephenson, Winnebago, Boone, McHenry, Kane, Ogle and Carroll counties, is infested to some degree. Since termites work almost entirely under cover, their presence is seldom suspected until the damage has been done. The flight of winged individuals should be heeded as indicating the presence of these insects about the property.

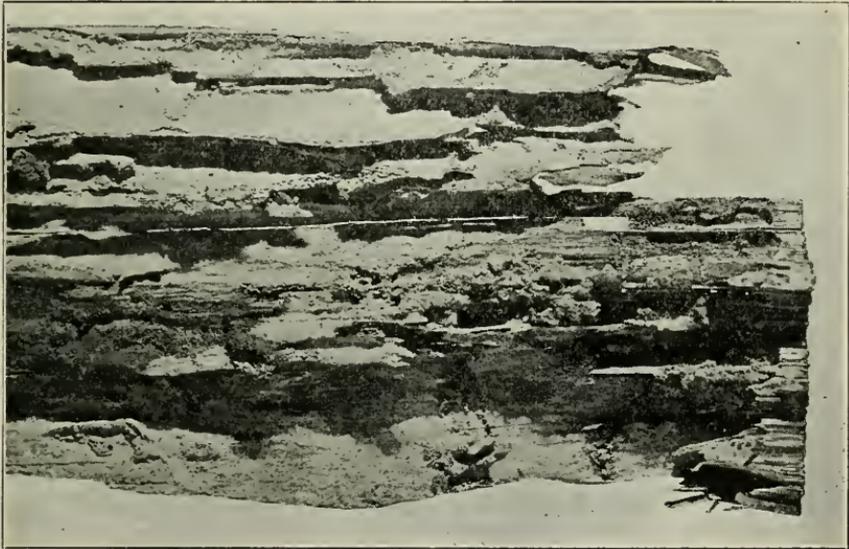


Fig. 4.—A SECTION OF 2" x 12" JOIST SHOWING HOW COMPLETELY TERMITES CONSUME THE WOOD

4. Are termites ants? Although popularly called "white ants," these insects are only remotely related to true ants, and for this reason the use of such a misleading common name is discouraged in favor of "termites." They undergo a different type of transformation from stage to stage and, for the most part, have quite different food habits, a fact which makes them much more difficult to control than are the true ants. The colony organization, also, differs much from that of true ants.

5. Where did termites come from? Our common species has long been known in North America. It at first maintained itself in and about dead trees and other vegetation in forests and fields, and still does so to a large extent. Quite likely these insects caused some

damage in the Indian villages long before white men entered the country. However, as man converted various forest products to his needs, the termites maintained themselves in the changing environment and became ravenous property-destroying pests.

6. What are the stages in the life of this insect? From eggs laid in subterranean chambers by the queen, there hatch minute white creatures resembling mature termites in all superficial ways except their size and the number of joints in the antennae. They are not at once able to take solid food, but are fed by the older insects. As growth proceeds, the skin is shed several times before the individual becomes mature. Preceding each moult, there is a brief period of retarded activity incident to the casting of the skin. Immediately following this act, the termite continues its destructive feeding.

Generally speaking, a termite may be said to pass through an egg stage and a series of several immature, or nymphal, stages before it finally becomes an adult. The earliest immature stages are separated with some difficulty, although in the later stages the characters for separation are rather definite.

7. What are the food habits of termites? Wood and other forms of vegetation comprise the bulk of the consumed food. Vegetable products, such as cotton and linen cloth, paper, paper board, straw board, and boxing, are typical of materials in which termites will also work. All kinds of natural wood, if slightly moist, will serve as food, although a few tropical hardwoods and the resinous portions of some conifers are partially resistant. Very wet wood is seldom attacked.

8. How are the nests established? During May and June each year, there appears from each well-established nest a large swarm of winged males and females. Of the myriads of them flying into the air, only a few survive the ravages of birds, predaceous insects, and other unfavorable conditions. A pair will alight and search out some suitable site in or under a log, stump, or other plant remnant. The wings soon break off, and mating occurs. The process of colonization is at first slow. A small cell is cut out, which in time is extended into a short gallery. A few eggs are deposited. These hatch, and in a few months the young begin cutting at the wood for food, thereby enlarging the gallery system. The queen's capacity to lay eggs increases, and there is a corresponding increase in the number of individuals in the nest. Thus, in a healthy colony, the system of galleries steadily becomes larger.

Certain secondary sexual forms to be found in most nests also wander to new sites through underground galleries, and thus establish new nests.

9. **What are suitable nesting sites?** Termites do not usually live in very moist situations, nor are very dry situations suitable for their colonies. They seem to prefer a moderately moist site where the wood, which serves as food as well as shelter for the colony, is directly in contact with the soil or, at most, only a few inches from it. Fairly wide departures from this rather ideal condition are sometimes found, yet moisture seems absolutely necessary, and a suitable food supply must be available.

10. **How are termites socially organized?** Essentially, there are three castes of individuals present in a nest. The workers are primarily engaged in cutting new galleries in the wood as they feed and in feeding the immature stages and queens. Most of the wood thus cut away is eaten at once. It is not digested by the termites themselves but is acted upon by innumerable one-celled intestinal residents which convert the wood into a material from which the termites derive their supply of energy. In addition to gallery cutting, the workers construct sheds of soil and wood particles to cover their runways where these are exposed. The several materials are firmly joined together with the aid of salivary and intestinal secretions.

The soldiers apparently are unable to cut and consume solid wood after becoming mature. Their food then consists largely of wood fragments partly digested by the workers, which they are able to secure in the galleries. With their large heads, they can effectively block the passage-ways against any enemy several times their size. They will also rush to the attack with wide-open jaws. If caught out of their galleries, however, they are at the mercy of even a weak adversary.

Several sexual phases may occur in a colony of termites. Of primary importance are the normal and fully developed males and females capable of flight. It is the queens which are most active in perpetuating the colony. However, should the colony for any reason lose the services of a true queen, there will usually be adopted a replacement queen from among certain immature termites. A few of these potential queens are to be found in the nest at all times and they may become capable of reproduction, although a true queen is functioning. The males continue to live after the colony becomes established, and they aid somewhat in gallery making.

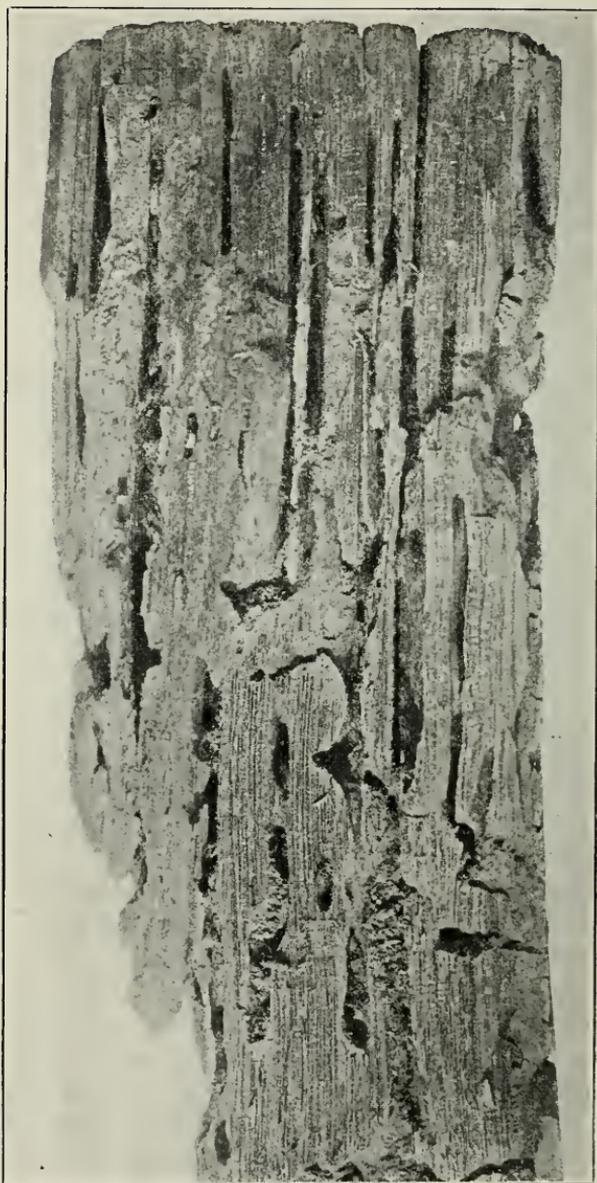


Fig. 5.—UPPER END OF A FENCE POST SHOWING
DAMAGE BY TERMITES

11. How long do termites live? There is little definite information upon which to base an answer to this question. It is probable that workers normally live from several months to a year or possibly longer, and queens are known to have lived as long as 25 years.

12. How may the presence of these insects be detected? Because the termites shun light at all times, except for swarming, they may be present in a building for a long time without being suspected. The following indications should be heeded as a timely warning of hidden danger:

(a) The appearance of large swarms of the filmy-winged, black creatures from February to June.

(b) The presence of few or many earthen sheds, or tracks, over the basement walls, and earthen tubes suspended from the joists. (See Fig. 6.)

(c) The weakening of flooring or other woodwork, whether plain or painted, usually first evidenced by blistering or warping of the surface. Investigation will usually reveal many of the white, ant-like creatures in galleries beneath the thin remaining shell of wood.

13. What conditions about a property are most likely to encourage an infestation?

(a) Wooden cellar windows, whether painted or plain, so set that soil or debris is, or may come, in contact with them, offer the path through which termites gain access to houses in 90 per cent of the cases examined in Illinois.

(b) Outside doors with wooden sills resting on the ground or on weak masonry, are liable to attack.

(c) Wooden porch and floor supports, resting on the ground or on masonry insufficient to keep soil and debris from about the base, are unsafe and through them termites may enter a residence.

(d) Buildings beneath which there is no cellar and in which wooden lower-floor supports either rest on the ground or are but slightly removed from it, offer points of entrance for termites. Such situations are frequently quite damp and so are favorable for termite colonization.

(e) Cellar walls are often of such imperfect masonry construction that termites are able to enter the cracks, weak mortar joining, or porous gravel concrete. The unbroken airway left in most brick or block walls, if accessible to the termites, is a favored place for extensive gallery making. If much more than 10 per cent of lime is incorporated into the mortar, the termites may actually dissolve away

sufficient material to permit their entrance into a building. Poured concrete walls should be firmly tamped.

(f) Dead portions of injured trees and dead stumps; posts, poles, wooden plant supports, and trellises set in the ground; heavy fibrous roots and stalks of dead and living plants; and large accumulations of moist leaves, brush, animal dung, and vegetable debris—all offer suitable feeding sites for termites.

14. What are the methods of checking ravages by termites?

(a) Only metal frames should be used for cellar windows when there is the least possibility of the frames coming in contact with soil.

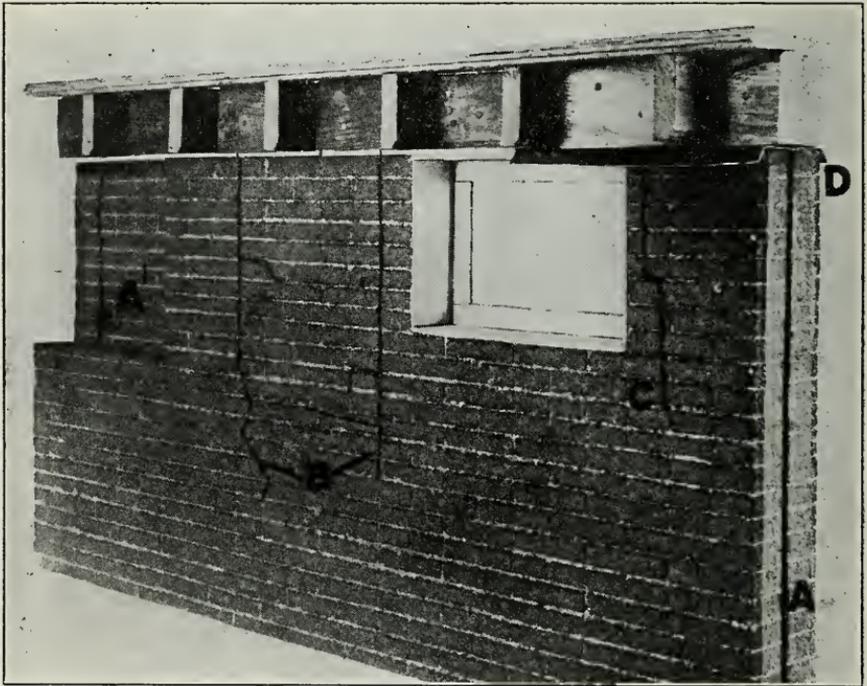


Fig. 6.—SECTION OF BRICK WALL SHOWING CERTAIN FEATURES OF A TERMITE INFESTATION

- A. Wall space left for insulating purposes, but offering recesses in which termites may build extensive sheds (A¹) or even establish a nest.
- B. Termite sheds on inner face of a wall. Note that sheds may pass over cement cap on wall to reach wooden sills and joists.
- C. Termite shed passing upward but stopped by metal termite guard.
- D. Section of metal termite guard in place. Note deflected projecting edges and the manner in which the wall space is completely intercepted. This type of installation is advised for brick or frame houses and should be inserted between sills and supporting foundation and partition walls.

(b) Any wooden structure or support which must be used in contact with the ground should be thoroughly saturated with hot crude coal-tar creosote to a point at least a foot above the line of contact. Pressure-impregnated wood is more durable and well justifies its use. Wooden posts and stair-risers in the cellar should rest on the concrete flooring and not extend through it. Outside supports of stairways should be of metal or masonry; if wooden supports are used, they should be mounted on tight, Portland cement piers.

(c) Mortar used in cellar walls should not contain much more than 10 per cent of lime. At some point, preferably at the top of the foundation, a metal, slate, or tight cement cap should be set so as to break completely any path between the air space in the wall and the wooden sills. (See Fig. 6.)

(d) All wood which must be set in the ground out of doors should be thoroughly soaked in hot crude coal-tar creosote. The surface so treated should extend at least a foot above the ground line. All dead or dying trees or stumps and other useless wood and plant remains should be burned at once. These should not be taken into the house for use as fuel when termites are known to be in them. All waste wood should be kept off the ground about the premises.

(e) In buildings already infested it will be necessary either to find the center of the nest and destroy this by soaking it with light oils, or to make installations based on the above suggestions.

(f) Only wood so damaged as to be mechanically worthless need be removed in making repairs, providing that thorough installation of insulating materials has been made. Those termites remaining in the wood will soon die, since they will be unable to reach a supply of moisture.

15. The keynote of success in combating termites is absolute thoroughness in insulating wood and dead plant remains from the earth through the use of metal, masonry, or creosote.

16. Co-operation within the community is the best assurance of success, since an infested property is a constant menace to adjoining buildings. The following recommendations advocated by Dr. T. E. Snyder of the United States Department of Agriculture, Bureau of Entomology, have served as the basis for certain clauses inserted in building codes in some southern and western States, to eliminate, if possible, future termite damage. They are given here with slight modifications for the use of Illinois communities wishing to take similar steps, since it is a fact, often proved in dealing with termites, that a dollar spent for prevention saves from ten to one hundred dollars necessary for elimination.

**PROVISIONS FOR BUILDING CODES FOR INSURING
PROTECTION FROM TERMITES AND DECAY**

1. Wood or fiber products, when not impregnated with an approved preservative, shall not be placed in contact with the earth or within 18 inches thereof, excepting wood columns or posts over a concrete floor which columns shall be provided with non-corroding metal or concrete base plates or footings 6 inches above the floor. This applies to steps, which shall be laid over a concrete base, projecting at least 6 inches beyond the supports of the steps.
2. Timber to be used in contact with the earth shall be thoroughly impregnated by a standard pressure process with coal-tar creosote or other equivalent preservative. Timber shall be completely framed before treatment, whenever possible, but when cutting after treatment is unavoidable the cut surfaces shall be thoroughly coated with coal-tar creosote or other equivalent preservative.
3. Masonry foundations and footings shall be laid in Portland cement mortar. Foundations built up of masonry units whether hollow or solid, shall be capped below woodwork with at least one inch of Portland cement mortar, or with mortar and slate, or solid or joined non-corroding metal, or other equally efficient seal.
4. In the case of frame buildings, a metal termite shield shall be provided, continuing completely around the top of the masonry foundation, including all pillars, supports, and piping, below the woodwork of the building, on both the inside and outside surfaces. Such a shield may be formed of a strip of non-corroding metal (such as copper, zinc, or an alloy of copper 28%, nickel 67%, iron, manganese and silicon 5%), firmly inserted in the surface of the masonry, or between the foundation and the wood so as to intercept the wall space, with the projecting edges bent downward at an angle of 45 degrees and extending horizontally at least 2 inches from the face of the foundation. In masonry buildings this shield can be inset in the masonry at a height of at least 18 inches above the ground.
5. Floor sleepers or joists imbedded in masonry or concrete, or laid on concrete which is in contact with the earth, shall be impregnated with an approved preservative.
6. Expansion joints between concrete floor and wall shall be filled with liquid asphaltum and the right angle joint covered with a sanitary cement mortar or Portland cement concrete finish of an arc of at least 2 inches in length.
7. The ends of wooden beams or girders entering masonry or concrete shall not be sealed in but shall be provided with boxes affording an air space at the end of the piece of not less than 1 inch at side of member, unless the ends of such timbers are impregnated with coal-tar creosote or other approved preservative.
8. Where there are spaces under floors near the earth, they shall be excavated so that there will be no earth within 18 inches of the wood, and they shall be provided with cross ventilation. Such ventilating openings shall be proportioned on the basis of 2 square feet for each 25 lineal feet of exterior wall, except that such openings need not be placed in front of such building. Each opening shall be provided with 20-mesh non-corroding metal screening.
9. All wooden forms on foundations shall be removed from masonry work within 15 days.

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