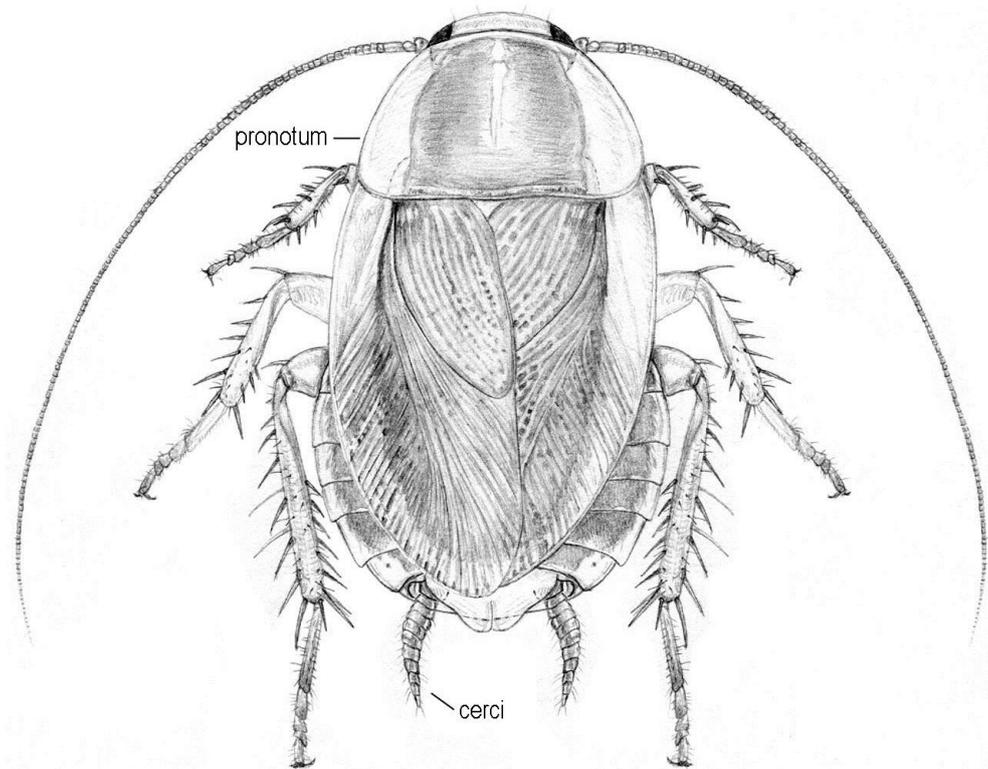


Order Blattodea
(= Dictyoptera; incl. Isoptera)



Common name: roaches, cockroaches, termites

The classification of the order Blattodea has been recently revised and now includes the termites (formerly order Isoptera, now superfamily Termitoidea of Blattodea, see below for diagnosis).

ROACHES ONLY

Simple diagnosis. Blattodea have a flattened oval body with a large disc shaped pronotum often covering some or all of the head, chewing mouthparts, head and mouthparts directed vertically, antennae threadlike and multi-segmented. They always have a pair of cerci at the end of the abdomen. Roach legs often have many spines and 5-segmented tarsi. Forewings when present are leathery tegmina with many veins.

Technical diagnosis. Roaches are flattened oval insects, that have a large and semicircular pronotum, often covering the posterior part of the head; leathery forewings with distinct venation; semicircular hindwings with well-developed anal (= fanlike portion of the hindwing) lobes. Roaches also have long multi-segmented, filiform (= thread-like) antennae; a head strongly hypognathous (= head and mouthparts vertically oriented) or sometimes opisthognathous (= ventral position of the mouthparts); well-developed mandibulate (= biting and chewing) mouthparts (= biting and chewing); distinct compound eyes, which are rarely reduced; ocelli often in the shape of ocelliform (= like ocelli) spots; and un-segmented or multi-segmented cerci (= paired terminal abdominal appendages). Nymphs resemble adults, but either lack wings or possess wing buds.

What can they be confused with? Roaches are separated most easily from termites in their body shape. The body of termites is never flattened (more or less round in cross-section), the wings always membranous and never leathery, and the eyes are often reduced or absent. Termites also have more moniliform (= bead-like) antennae with 10 to 31 segments, and legs most often with 4-segmented tarsi (very rarely 5-segmented).

Roaches can be sometimes confused with some hemipterans such as plant and leaf hoppers also can have forewings that are leathery and spiny legs, but roaches always have their forewings held flat over the body, chewing mouthparts and cerci. Bristletails and silverfish also have long threadlike antennae and cerci. In contrast, roaches have short cerci and no medial filament, an oval shieldlike pronotum extending over the head and the body without scales. Some representatives of the suborder Heteroptera (Hemiptera) also have somewhat flattened and oval bodies and leathery forewings with veins, but can easily be distinguished by the piercing-sucking tubelike mouthparts.

Roaches also share some similarities with Dermaptera (earwigs), in having a flattened body, non-modified mandibulate (= biting and chewing) mouthparts, thickened forewings, hindwings with large anal region, tip of abdomen with cerci and a shield-like pronotum. However, Dermaptera differ in that the body is not oval, cerci are nearly always greatly enlarged and have forceps (= enlarged unsegmented pincer-like processes at end of abdomen), the head is prognathous (= head and mouthparts directly anteriorly), forewings are often shortened and without veins, and the tarsi are 3-segmented.



Cockroach (Blattodea)

Biology. Roaches are diurnal or nocturnal. They are most diverse in tropical regions. Some species are infamous for being pests in human dwellings. In nature they live under stones and logs, or among foliage, and are polyphagous (= varied diet) and mostly saprophagous (= eat dead or decaying vegetable matter). Some species can eat wood.

Diversity in Papua New Guinea. Roaches have a worldwide distribution, and comprise about 4000 described species. The native New Guinea fauna is poorly known (Miller 2007).



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Key references for Papua New Guinea.

Roth, LM. 1990. Blattodea. *Insects of Australia*, CSIRO Publishing, Melbourne.

Roth, LM. 2003. Systematics and phylogeny of cockroaches (Dictyoptera: Blattaria). *Oriental Insects* 37: 1-186.

Superfamily Termitoidea

(Blattodea: Superfamily Termitoidea)

Common names: termites

TERMITES ONLY

Simple diagnosis. Termites are social insects that have a soft, pale cylindrical body, with distinct thoracic segments, chewing mouthparts, the head and mouthparts project vertically, the antennae are bead-like with 10 to 32 segments, the tarsi are usually 4-segmented, and the tip of the abdomen has small limb-like (= cerci) structures.

Technical diagnosis. Termites are social insects that live in colonies and usually have castes, including reproductives, soldiers and workers. Termites are usually pale insects with an elongate body, with all thoracic segments separate, the pronotum (= shield-like sclerite on the dorsal surface of the thorax, adjacent to the head) is subrectangular and does not cover the head, the fore- and hindwings are membranous, subequal in length, and have reduced venation (= system of wing veins), without cross-veins (= small veins that connect longitudinal veins), the tarsi are often four-segmented, rarely five-segmented (only *Mastotermes*), and the tarsal segments are not swollen, the cerci are 1- to 5-segmented, the head is hypognathous (= directed ventrally), sometimes prognathous (= directed anteriorly), the mouthparts are mandibulate (= biting and chewing), and usually not modified (they can be long and exaggerated or reduced in soldier caste), the eyes are often reduced or absent, especially in workers and soldiers, and the antennae are moniliform (= bead-like) or filiform (= thread-like) with 10 to 32 round or elongate segments.

Alates (= winged caste) are small to moderately sized (= body length ranges between 6 to 18 mm). They have two pairs of membranous wings that are roughly the same size, with reduced venation (= system of wing veins) and no cross-veins or cells, and are folded flat over the body.



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Workers and soldiers are usually smaller than the reproductives (= body length ranges between 2.5 to 15 mm), wingless, have well-developed cursorial (= walking) legs, and usually lack eyes. The head of workers is more sclerotised (= robust and thickened cuticle) than the thorax and abdomen. In soldiers with reduced mandibles, the head is elongate anteriorly, forming a nasus (= anterior projection on the head).

Immature individuals of each caste usually resemble adults. The nymphs of alate forms often have wing buds.

What can they be confused with? Termites are closely related to roaches. Roaches usually live in leaf litter or foliage and are not social like termites, although some species are gregarious (= individuals aggregate together) or have limited social behaviour. Unlike termites, the body of roaches is flattened, with a shield-like pronotum covering at least the posterior part of the head, the forewings are sclerotised (= robust and thickened), the antennae are long with many segments, the eyes are well-developed and the tarsi are 5-segmented.

Like termites, ants are also social insects that have chewing mouthparts, live in colonies, and have castes with winged forms. Termites can be distinguished from ants by having bead-like or threadlike antennae about as long as the head and the antennae are not elbowed as in ants (= geniculate or elbowed antennae). Termites also have a uniformly cylindrical abdomen which attaches broadly to the base to the thorax (cf. ants which have a narrow waist), short abdominal cerci (= leg-like appendages at tip of abdomen), and forewings and hindwings that are roughly equal in size (when wings are present), which are held flat over the body. Termites also have an open venation system with no cross-veins or closed cells.

Termites are similar to the order Zoraptera. Zorapterans are known to sometimes live in termite nests. Zorapterans have winged and wingless forms, reduced wing venation (= system of wing veins), separated thoracic segments, mandibulate (= biting and chewing) mouthparts, moniliform (= bead-

like) antennae, often-reduced eyes and short unsegmented cerci. Zorapterans differ from termites by having the forewings longer than the hindwings, the tarsi are 2-segmented, and the adults are very small.

Termites are similar to Embioptera (= footspinners), as they live gregariously (= aggregate together), have winged and wingless forms, similar antennae with 12-32 segments, mandibulate (= biting and chewing) mouthparts, fore- and hindwings that are roughly equal in length, and short cerci. In contrast to termites, embiopterans live in silk galleries, possess well-developed eyes, have 3-segmented tarsi, the foretarsi have a greatly swollen first segment (= for silk production), 2-segmented cerci, and the wings have cross-veins. Embioptera do not form true castes.

Termite workers can be similar externally to wingless representatives of Psocoptera (= book lice), as they both have a large head, mandibulate (= biting and chewing) mouthparts, moniliform (= bead-like) or filiform (thread-like) antennae, and often reduced eyes. Psocopterans differ in having the clypeus greatly rounded and swollen, mouthparts are modified for scraping, the antennae are filiform are usually much longer than the head, the pronotum is usually small, the tarsi are 2- or 3-segmented, and the cerci are absent.

Biology. Termites are social insects which live in colonies, and are composed of several castes and they have winged forms. Alates (= winged forms) can usually be found outside of termite mounds. After flight, alates can lose their wings, and are then move to within a colony, where they mate and form 'kings' and 'queens'. During the reproductive phase they are usually deep found inside the termite mound. The abdomens of queens can be swollen to grotesque proportions to accommodate her eggs. Soldiers protect the colony. Workers are the most numerous caste and forage for food, feed the other castes and repair the nest. Soldiers and workers do not take part in reproduction.

Termites mainly inhabit tropical and subtropical regions. They feed on cellulose found in decayed wood, fungi, grass, timber and other woody material. They can contribute greatly to the recycling of dead wood and soil formation. They are social insects that have cast systems, with winged reproductives, soldiers and workers.

Diversity in Papua New Guinea. Termites are mostly found in tropical regions of the world, and include more than 2300 species. The New Guinea fauna is poorly known (Miller 2007).

Key references for Papua New Guinea.

Watson, JAL & Gay, FJ. 1990. Isoptera. *Insects of Australia*. CSIRO Publishing, Melbourne.

Roisin, Y & Pasteels, JM. 1996. The nasute termites of Papua New Guinea. *Invertebrate Taxonomy* 10: 507-616.