

# LONG LIVE The QUEEN

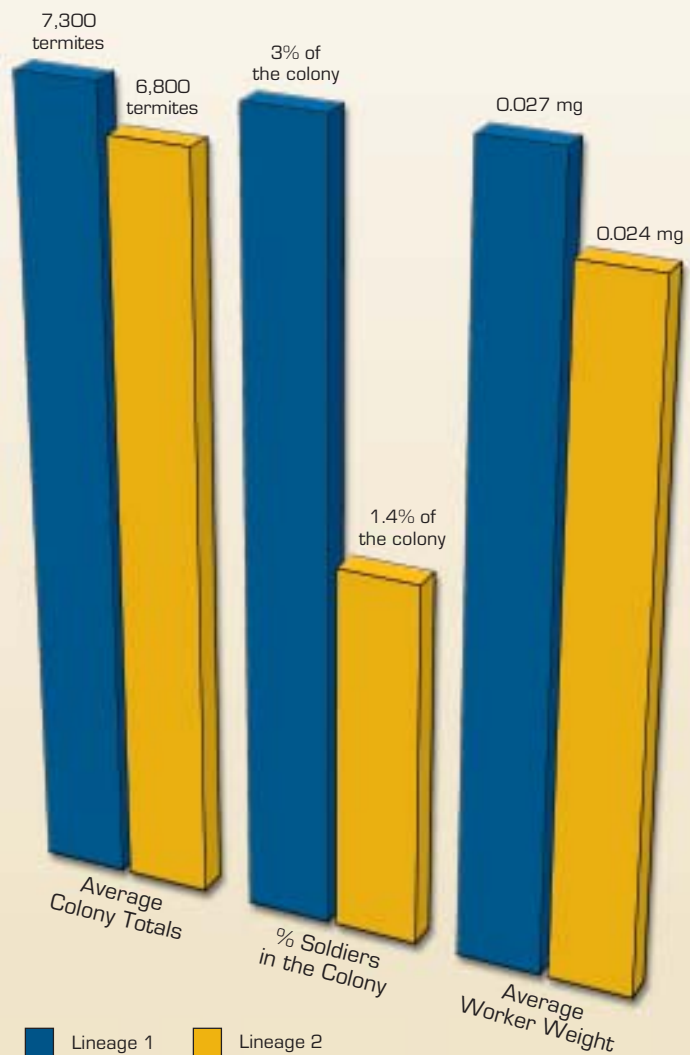
New University of Maryland research reveals termite colony secrets.

By Catherine E. Long, Dr. Barbara L. Thorne and Dr. Nancy L. Breisch

**H**ow long do king and queen termites live? How fast can their colonies grow and how big can they get? What happens when the king or queen dies? What determines the number of soldiers in a colony? Answers to these questions will help us better understand how termite colonies function and grow. They may be influenced by external variables, including food availability and predation, or by internal variables, such as colony age and the number of egg-laying females in the colony. In addition, genetic factors may also play a role. The more we understand about the factors contributing to termite colony function and expansion, the better we will be at designing and implementing effective detection and control strategies.

There is an almost insurmountable impediment to the study of natural field populations of subterranean termites and the common name says it all — subterranean. They live underground. Not only is their habitat virtually inaccessible to us, anyone who has used baits or monitoring stations knows that termites may respond to a disturbance by abandoning galleries for days or weeks. So how can we get information on the biology and behavior of these colonies? Captive lab colonies are the almost perfect solution. Although life in a pampered lab environment with food, water, and protection from enemies undoubtedly impacts individual termite life spans

All colonies *aren't* the same. At right, how colonies from two sources stack up.



and the rate of colony growth, lab data reflects what probably occurs in the field.

**THE TERMITES.** In the spring of 1993 we collected termite alates from two widely separated swarming colonies in Maryland. The two swarms allowed us to raise colonies derived from two separate parental lineages: 21 of the colonies were

founded by alates from the first source (lineage 1) and nine colonies with royal pairs from the second (lineage 2). By raising all of the termite colonies under identical conditions, we minimized the impact of varying environments on their development. If each colony had encountered different challenges, such as varied food quality or availability, competition, or predation, separating the

contribution of the inborn traits from their responses to the outside world would be impossible. This does not mean that external events and conditions do not impact colony characteristics, rather there are some inborn, inheritable differences underlying the variation among colony lineages.

The 30 complete colonies were censused periodically, most recently when the nests were 8 years old. During a census, each colony-nesting container was



Kings and queens can thrive for up to eight years in the lab, raising ever-growing families.

opened and all the wood was carefully dissected, enabling us to count each termite. The total number of reproductives, workers, soldiers, immatures and pre-swarmers (individuals with visible wing-buds) was compiled and weights were taken to calculate an average for each caste. Our data has been consistent over time, so here we will focus on results of the most recent census.

**THE RESULTS.** Although the colonies from the two lineages were essentially the same size, we discovered evidence for inherent genetic differences: Lineage 1 colonies always had nearly twice as many soldiers as Lineage 2 and individuals in all the castes of lineage 1 were larger than lineage 2 (see table on page 78). Amazingly, 26 (87 percent) of the original queens and 29 (97 percent) of the original kings were still alive and producing offspring eight years after founding their colonies (see photo above). Finding an established termite queen and king in the field is a rare event; keeping track of them over time in nature would be impossible, so these lab colonies provide unusual insight into the potential lifespan of a royal pair.

As in many termite species, the death of either the king or the queen from a *R. flavipes* colony may stimulate development of immature offspring into replacement reproductives ("neotenics") (see photo on page 82). Multiple female neotenics can differentiate simultaneously



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after the loss of a queen, and together these females might have greater egg-laying capacity than single primary queens. There is growing evidence that female neotenics can sometimes develop even in the presence of healthy kings and queens. Our lab colonies provide an opportunity to examine the relationship between a colony's reproductive status — one primary queen, numerous neotenics, or a combination — on colony development and growth.


Neotenic reproductives were identified in five of our 30 lab colonies, all of which retained one of their founding parents: four contained a surviving king and one a surviving queen. The queenless colonies contained exclusively female neotenics while the one kingless nest contained 127, mostly female, neotenics. Contrary to our expectations, the queenless and with-queen colonies were equivalent in total



Replacement reproductives don't look exactly like the original kings and queens, but they do the same job.

size; worker, soldier and egg number; as well as soldier weight. Colonies with both a king and a queen contained many more immatures than queenless nests and their workers were significantly smaller. The five colonies containing neotenics contained hundreds more pre-swarmers than the colonies with both

founding parents. These individuals were beginning to grow wings and may have developed in anticipation of a swarm.

Advances in the applied arena would be impossible without a strong foundation of basic research. Termite colonies are complex, but as research advances our understanding of all aspects of their biology we will develop a more precise composite picture of what is happening underground and in hidden chambers in wood. 

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