Volume 1587

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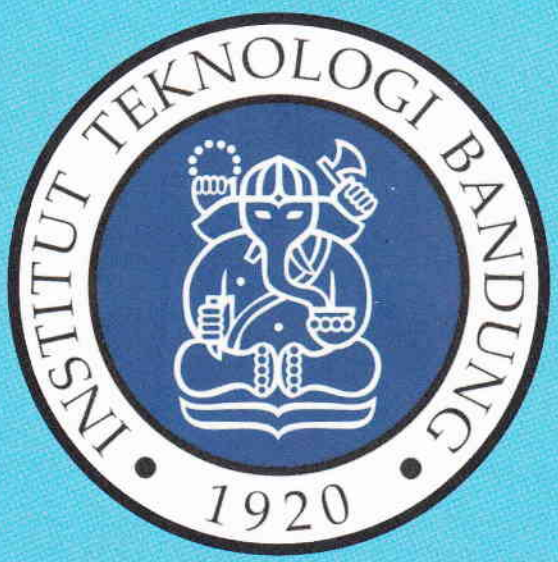

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AIP Proceedings

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All papers has been peer reviewed

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AIP Publishing
Melville, New York, 2014
AIP Proceedings

Volume 1587

Editors

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ISBN 978-0-7354-1219-4
ISSN 0094-243X
Printed in the United States of America

Model for Social Interaction, Competition and Dominance in Ant Colonies

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Abstract. It has been known that characteristic of social life within ant colonies includes efficient class division, harmonious appearance, but also competition within nestmates. Conflict between queens, male and female labors frequently occurs due to different interest among class members. A mathematical model for interaction between queens, male and female workers in ant colonies is discussed here. Interesting phenomena such as male-male competition and queen dominance are analyzed and stable coexistence is shown. It is also shown that heavy competition is even necessary to maintain a certain level of coexistence in the colonies.

Keywords: competition, stability of coexistence, dynamical system ant colonies.
PACS : 87.10 Ed

INTRODUCTION

The characteristic of social life of the ant colonies includes efficient class division, harmonious appearance, but also conflict within nestmates. A colony structure of ants in general built for the Queen, males and workers, with the ultimate power held by the queen. In few colonies of ant, the queen usually adopted the subordinate queen, the namely as "gyne" of female ants. Conflicts usually occur because struggle the due to reproduce or to monopolize the due to mating with queens, which can occur between young males and old males, old males and old males, subordinate queen and subordinate queen, or worker and subordinate queen, depending on the ant colony types [1], [2]. In this paper, there are two colonies of ants that will be studied, namely ant colony *Leptothoraxacervorum* and ant colony *Cardiocondylaobscurior*. The colony of the *L.acervorum* and ant colony *C.obscurior* is characterized by lethal fighting that occurs among a class member, but they are coexistence. *L.acervorum* is a small red ant from family Formicidae and subfamily Mymicinae. *L.acervorum* is widely distributed in Eurasia, ranging from central Spain and Italy to the northernmost parts of Scandinavia and Siberia. They nest in small rotting branches, tree stumps, and under bark [3], with the structure of the colony consists of a queen, subordinate queen, male ants, and workers (female ants). *L. acervorum* is an ant colony monogyny functional, that is an ant colony with only one queen is allowed to reproduce. In the ant colony, the queen acts as reproducers and also the highest authority holder which is supported by the workers. The queen also adopted some workers to be gyne, which at one time gyne can become queen after passing competition among gyne, and also competition with workers[1].

C.obscurior is an ant that lives along the pacific island with small size, both concerning individual body size (~ 2 mm) and colony size (1-5 queen, 20-30 workers) [4]. The structure of the ant colony consists of female sexes, workers (females), wingless "ergatoid" males, and winged males. In this colony, the queen of *C. obscurior* reproduce while workers do not have ovaries so it can not contribute to produce offspring in the colony. In this colony, the queens of *C. obscurior* reproduce while workers do not have ovaries so it can not contribute to produce offspring in the colony. Throughout their lives, all queens that had produced less than five sexuals each and 39 produced in total 127 males and 1193 females [5].

The ant *C. obscurior* is characterized by lethal fighting between wingless "ergatoid" males.The aim of male-male competition is to monopolize the virgin queens closing in the nest. The oldergatoid males consistently won fights against ergatoid males younger than two days [2]. The Winged males protect themselves from attacks with perform a chemical female mimicry and they will disperse from the their colony after about 10 days [7].

Of some of the research that has been conducted on the ant *L. acervorum* and ant *C. obscurior* about the social life of this ant colony, we will construct a model the competition of the two colonies, then divide the model by case for each colony. After that, the resulting

Symposium on Biomathematics (Symomath 2013)
AIP Conf. Proc. 1587, 22-27 (2014); doi: 10.1063/1.4866526