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## Save Isoptera: A comment on Inward *et al.*

Nathan Lo, Michael S Engel, Stephen Cameron, Christine A Nalepa, Gaku Tokuda, David Grimaldi, Osamu Kitade, Kumar Krishna, Klaus-Dieter Klass, Kiyoto Maekawa, Toru Miura and Graham J Thompson

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## Comment

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A number of phylogenetic studies during the last decade have shown that termites—one of the main groups of eusocial insects—are a type of cockroach, whose closest living relative is the wood-feeding genus *Cryptocercus* (reviewed in [Klass & Meier \(2006\)](#) and [Inward \*et al.\* \(2007\)](#)).

Inward *et al.* addressed the taxonomic issue of having an order (Isoptera; termites) nested within another order (Blattaria/Blattodea; cockroaches). They suggested that the ordinal rank that has long been afforded to termites be downgraded—‘Death of an Order’—and proposed that termites be placed in a single family (Termitidae). While we agree with downgrading termites, we believe ranking them as a family will unduly destabilize termite nomenclature and disrupt scientific communication. In this paper, we outline the negative impact of Inward *et al.*’s taxonomic proposal and suggest alternative schemes more consistent with prevailing usage.

First, Inward *et al.*’s proposal has consequences because the major termite lineages are already well defined at the family rank and an enormous biological and economic literature has employed this system of names. Currently, termites are classified into seven families: Mastotermitidae; Termopsidae; Hodotermitidae; Kalotermitidae; Serritermitidae; Rhinotermitidae; and Termitidae. These names are almost universally accepted and used ([Engel & Krishna 2004](#)). Thus, forcing their translation to the lower ranking suffix of subfamily (-inae) is unlikely to become widely adopted. Family is therefore not an ideal rank for the termites because it does not

acknowledge the stability of present family names and, further, it would impose a burden of translation onto future researchers who will in perpetuity need to reconcile past with future designations.

Second, Inward *et al.*’s proposal to label termites as ‘Termitidae’ is unfortunate because the name Termitidae is already in service, describing a phylogenetically derived and highly speciose clade. If Termitidae is redefined to describe all termites, then the lineage that currently bears this name would also need to be redefined to a lower rank. To this end, Inward *et al.* suggest subfamily. However, the appropriate subfamily name (Termitinae) is also already in service, which would force another downstream change. This ramifying problem is not limited to the Termitidae and similar confusion would result for all current families with their nominate subfamilies. In total, there are 29 familial or subfamilial names that would need to be modified in order to implement Inward *et al.*’s single upstream correction. Thus, to implement their taxonomy is to undermine the existing classification in its entirety and burden the vast literature with ambiguity. Indeed, even a cursory search through *Zoological Record* recovers over 7600 articles employing Isoptera and over 1350 using Termitidae in its current sense; this does not cover the more extensive pest management or economic literature.

Finally, there remains considerable uncertainty about relationships among the major cockroach lineages, which is of key relevance to their classification. This is highlighted in [figure 1](#), which shows the molecule-based topology of Inward *et al.* and the morphology-based topology of [Klass & Meier \(2006\)](#). Although the two trees are in agreement regarding the termite–*Cryptocercus* relationship, they are in marked disagreement in other areas. The phylogeny of Blattaria thus appears far from settled. Notably, both studies lack key blattarian taxa, such as Tryonicidae and Lamproblattidae in Inward *et al.*, and Nocticolidae and subfamilies of Polyphagidae in [Klass & Meier \(2006\)](#). Until robust inferences of relationships among all major lineages of Blattaria are obtained, it is premature to select a particular taxonomic rank for termites within the order.

Figure 1. Relationships among most major cockroach lineages remain unresolved. Two competing hypotheses are shown, based on (a) molecular data (from [Inward \*et al.\* \(2007\)](#)) and (b) morphological data (from [Klass & Meier \(2006\)](#)). Confidence values above and below key nodes are (a) posterior probabilities and bootstrap values; (b) bootstrap values and decay indices. Hashes indicate nodes that were not supported during maximum parsimony analyses by Inward *et al.* (Nocticolidae was found nested within Blattellidae).

We thus propose that Isoptera be retained as an unranked name within Blattaria (i.e. Blattaria: Isoptera), until cockroach phylogeny is better resolved and an appropriate ranking can be applied. We note that zoologists regularly recognize non-ranked clades (e.g. Anthophila (bees)), and that our proposal does not contravene the International Code of Zoological Nomenclature (since the code does not govern suprafamilial taxa). Options for the future include ranking termites as a suborder or an infraorder ('Isoptera' could then be retained), or as a higher family level rank such as superfamily or epifamily (resulting in 'Termitoidea' or 'Termitoidae'). Any of these alternatives create the appropriate downgrade for Isoptera while simultaneously maintaining existing names at the level of family and below, thus preserving nomenclatural stability—one of the fundamental goals of taxonomy.

Nathan Lo<sup>1,\*</sup>, Michael S. Engel<sup>2,6</sup>,  
 Stephen Cameron<sup>3</sup>, Christine A. Nalepa<sup>4</sup>,  
 Gaku Tokuda<sup>5</sup>, David Grimaldi<sup>6</sup>, Osamu Kitade<sup>7</sup>,  
 Kumar Krishna<sup>6</sup>, Klaus-Dieter Klass<sup>8</sup>,  
 Kiyoto Maekawa<sup>9</sup>, Toru Miura<sup>10</sup>,  
 Graham J. Thompson<sup>1</sup>

<sup>1</sup>*Behaviour and Genetics of Social Insects Laboratory,  
 School of Biological Sciences, The University of Sydney,  
 Sydney, New South Wales 2006, Australia*  
 \*nathan@usyd.edu.au

<sup>2</sup>*Division of Entomology, Natural History Museum,  
 University of Kansas, Lawrence, KS 66049-2811, USA*

<sup>3</sup>*CSIRO Entomology, Canberra, Australian Capital  
 Territory 2601, Australia*

<sup>4</sup>*Department of Entomology, North Carolina State  
 University, Raleigh, NC 27695-7613, USA*

<sup>5</sup>*Center of Molecular Biosciences, University of  
 the Ryukyus, Nishihara, Okinawa 903-0213, Japan*

<sup>6</sup>*Division of Invertebrate Zoology, American Museum of  
 Natural History, New York, NY 10024, USA*

<sup>7</sup>*Natural History Laboratory, College of Science, Ibaraki  
 University, Mito, Ibaraki 310-8512, Japan*

<sup>8</sup>*State Natural History Collections Dresden, Museum of  
 Zoology, 01109 Dresden, Germany*

<sup>9</sup>*Department of Biology, University of Toyama, Gofuku,  
 Toyama 930-8555, Japan*

<sup>10</sup>*Laboratory of Ecology and Genetics, Graduate School  
 of Environmental Earth Science, Hokkaido University,  
 Sapporo 060-0810, Japan*

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