be the more tractable of these options because, by definition, we can never know exactly how many undetectable individuals exist. For instance, sampling methods that use passive gear such as traps and static nets will always be biased toward the most active and exploratory individuals. Fortunately, there are also sampling methods that possess much less bias such as nets that sweep across large areas for sampling fish [3], actively driving animals into traps, sampling all nest sites available for breeding in birds [11], sampling over extended periods of time [5] and visual observations that could reveal whether certain individuals with distinct markings are invulnerable to capture [11].

If eliminating all personality-related sampling bias is not possible, then determining the distribution of any trait in a population to infer its fitness costs and benefits will be problematic. Of course, it is still early days for research on animal personality in nature, and although personality traits can be stable over time and are often heritable [2], it is not clear that personality-related biases will necessarily be present in all contexts and life stages. Therefore, the bias we describe here could vary across ecological contexts and life stages, creating variable amounts of bias in the traits we are interested in quantifying. Nonetheless, this much seems clear: sampling bias due to personality variation exists and is likely to be widespread, indicating that future studies should take this problem seriously by making efforts to minimise its impact when sampling.

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Letters

Oil palm: disinformation enables deforestation

Lian Pin Koh[1] and David S. Wilcove[2]

[1] Institute of Terrestrial Ecosystems, ETH Zürich, Universitätstrasse 16, Zürich 8092, Switzerland
[2] Woodrow Wilson School of Public and International Affairs, and Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544, USA

In a recent article in *Trends in Ecology and Evolution*, Fitzherbert *et al.* [1] discuss the exponential expansion of oil palm (*Elaeis guineensis*) agriculture. The article sounds a warning call about the potential impacts of oil palm expansion on tropical forests and biodiversity, particularly in Malaysia and Indonesia; this concern is shared by many environmentalists and concerned scientists [2,3]. However, in spite of efforts by conservationists to curtail deforestation due to oil palm, the global market for palm oil continues to expand. Why have efforts by conservationists failed to halt the expansion of oil palm plantations at the expense of tropical forests? We contend that part of the reason could be the aggressive public relations campaigns undertaken by the oil palm industry to promote public acceptance of palm oil and to dismiss the concerns of conservation biologists and environmentalists. It is not unlike the campaign that some energy companies waged against efforts to curb global climate change.

Corresponding author: Koh, L.P. (lian.koh@env.ethz.ch).

For example, the Malaysian Palm Oil Council (MPOC) has repeatedly claimed that oil palm expansion in that country does not threaten biodiversity because 'land [has been] mainly converted from former rubber, cocoa and coconut cultivation, and no rainforest land has been used since 1990' (see http://www.mpoc.org.my/envo_100407_02.asp). This claim was recently debunked by a study concluding that for the period 1990–2005, 55–59% of the total extent of oil palm expansion in Malaysia, and at least 56% of that in Indonesia, had likely occurred at the expense of old-growth or secondary (logged) forests [3]. Oil palm advocates have also claimed that oil palm plantations are actually beneficial for biodiversity. One promotional video goes so far as to call them 'planted forests' rather than plantations (see http://www.mpoc.org.my/main_mediacenter.asp). Fitzherbert *et al.* and other researchers have shown that, in fact, oil palm plantations harbor far fewer forest-dwelling species than either primary or logged forests [1,3].

Another argument often made by the oil palm industry is that because many developed countries have destroyed more of their original forest cover than either Malaysia or

Indonesia, politicians and conservation groups from these Western nations lack the moral authority to interfere with oil palm development in Southeast Asia (see http://www.mpoc.org.my/envo_020706_01.asp). We leave it to the reader to decide whether such an argument is persuasive. However, it is important to note that forests in Malaysia, Indonesia and elsewhere in the tropics contain a far greater diversity of species – many of which are threatened or endemic – than do forests in most developed (i.e. temperate-zone) countries [4–6]. Thus, deforestation due to oil palm expansion threatens to drive far more species to extinction than did prior episodes of deforestation in countries such as the United States and United Kingdom.

The Malaysian government recently announced that it will ban the conversion of 'protected forests' and 'forest reserves' to oil palm plantations, and will only allow areas zoned for agriculture to be developed (see http://news.mongabay.com/2008/0626-palm_oil.html). This decision was apparently made to improve the international image of the country's oil palm industry. But it provides little optimism for conservationists for two reasons. First, it is unclear what type of land has been or will be designated for agriculture. If, for example, unprotected secondary forests are no longer considered forest (because they have been logged) and are instead classified as agricultural land, then oil palm conversions will likely continue. Second, immediately following the above announcement the Malaysian government also declared that it has acquired land in Aceh, Indonesia (45 000 ha), Papua New Guinea (105 000 ha) and Brazil (100 000 ha) for oil palm development (see http://news.mongabay.com/2008/0709-amazon_palm_oil.html). This further suggests that oil palm agriculture will continue to expand at the expense of tropical forests.

To effectively mitigate the threats of oil palm to biodiversity, conservationists need to persuade consumers to continue to demand both greater transparency in land-use decisions by governments and greater environmental accountability from oil palm producers. A prohibition on the conversion of primary or secondary forests to oil palm is urgently needed to safeguard tropical biodiversity. Until that happens, oil palm might well be the single most immediate threat to the greatest number of species.

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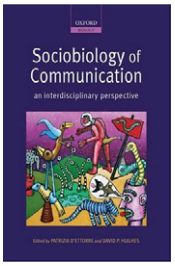
Book Review

Diverse views of communication

Sociobiology of Communication edited by Patrizia d'Ettorre and David P. Hughes. Oxford University Press, 2008. US $150 (hbk), US $75 (pbk) (320 pages) ISBN 978-0-19-921683-3 (hbk), ISBN 978-0-19-921684-0 (pbk)

Michael J. Ryan

Section of Integrative Biology, 1 University Station, C0930, University of Texas, Austin, TX 78712, USA



Communication takes place when a signal produced by a sender influences the probabilistic response of the receiver. This definition brings to mind birds singing, moths wafting odors or fruit flies producing love songs. But what about neurons, bacteria, slime moulds and our own genes? The purpose of *Sociobiology of Communication* is to push the envelope of the definition of communication. Two themes run throughout. One is that communication takes place in many taxa and under many circumstances in which it has not previously been appreciated. The second theme is signal reliability: how can signal 'honesty' be maintained when it would pay signalers to deceive receivers?

The table is set for both themes in the first chapter by Amotz Zahavi. He gives a cogent explanation of his handicap principle and offers the intriguing but debatable advice that 'explaining the special investment (the handicap) required by a signal provides a better understanding of its message than the common practice of deducing the message encoded in the signal from the reaction of the receiver to it.' If the same signal attracts a mate while it repels a rival, he tells us, it is neither a courtship nor a threat display but a signal of strength. Zahavi then employs the handicap approach in understanding signals in two rather diverse systems, babblers and slime moulds. There are no data presented here, just a forceful argument based on first principles. But as the rest of the book shows, hypotheses such as these are indeed testable.

A most interesting chapter is by Diggle *et al.* on quorum sensing in bacteria. In a well-studied example, *Vibrio* bacteria congregate in the light organ of a squid. The bacteria produce diffusible signals that bind to specific receptors. Once a threshold is reached, the bacteria start to emit light. It is thought that the light is a

Corresponding author: Ryan, M.J. (mryan@mail.utexas.edu).