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Effects of forest conversions to oil palm plantations on freshwater macroinvertebrates: a case study from Sarawak, Malaysia

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Oil palm plantations in Malaysia are expanding rapidly due to global oil and biofuel demand. This is of particular concern, as the conversion process of forested land to oil palm plantations and the maintenance of a plantation can significantly alter freshwater ecosystems. This is a result of the initial loss of a forested catchment, particularly the riparian vegetation, changes to the bed and banks of streams, sedimentation and changes to detrital inputs. In addition, various chemicals used on the plantations leach into the nearest waterways and can potentially affect freshwater macroinvertebrates. In the Malaysian region, these are largely endemic and generally incompletely known. This study assesses the impact of oil palm plantations on stream macroinvertebrates by comparing four steams flowing through undisturbed rainforest and four streams flowing through oil palm plantations in Sarawak, Malaysia. Freshwater macroinvertebrates were sampled using the standard three-minute kick sample method with accompanying chemical measurements. Although there were no distinct differences between the control and oil palm streams in the chemical data, the invertebrate communities provided a different interpretation of stream quality. Invertebrates were more abundant, species rich and diverse in rainforest streams than in oil palm ones. Most noticeably, two whole orders of insecta, Coleoptera (beetles) and Hemiptera (true bugs), were absent from the oil palm streams. This may be the result of the disappearance of natural bank habitats, the sensitivity to the pesticides targeted at the Rhinocerous beetle (*Oryctes rhinoceros*), or a combination of both.

Keywords: oil palm; macroinvertebrates; freshwater streams; land use; deforestation; pollution

Introduction

The physicochemical conditions of many streams in tropical countries are deteriorating as a consequence of rapid land-use change, population growth, increased industrialisation and intensified agricultural practices (Dudgeon, 1992). Oil palm is the principal economic driver of this in Malaysia, bringing in approximately RM30 billion annually (Basiron, 2007). In the state of Sarawak alone, land conversion rates increased by 87.1% between 1998 and 2003 (Mielke & Mielke, 2000, 2003). In this region, there are numerous endemic tropical stream macroinvertebrates with many that have not been catalogued to genus or

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