



Curtin University



Faculty of Science and Engineering

2020 Australian Government Research Training Program Scholarships

Strategic Project Profile

PROJECT TITLE: Dust and distress: evaluating and managing stress levels of EPBC-listed fauna associated with mining

FIELD OF RESEARCH CODE: 0502

PROJECT SYNOPSIS:

Background:

Numerous studies indicate that tangible disturbances such as noise, vibration and habitat loss or alteration impact upon fauna. However, we hypothesize that more intangible disturbances such as peripheral contamination by metal-laden dusts produced during mineral extraction and processing (e.g. particulates of lead, arsenic, and cadmium) may also be acutely or chronically deleterious to resident wildlife. These air-borne contaminants are often deposited into natural areas as dust or by runoff or containment failure, are persistent in the environment, and may bioaccumulate, causing elevated stress levels and reduced fitness at multiple levels of biological organisation. Although activities such as the annual monitoring of fauna is an effective and efficient method of understanding population size and stability, it does not provide quantitative data on the behaviour or health of individuals or populations. Merely confirming the presence of a species in the vicinity of a mine site does not mean that individuals of that species are healthy, nor does it provide an indication of the adaptability or resilience of the

population to the disturbance and environmental change caused by mining operations. This is of critical importance for operations potentially impacting upon EPBC-listed fauna, as approvals are often contingent upon providing empirical evidence that mining activities do not negatively affect the long-term fitness of these species.

Objectives:

The proposed research project aims to evaluate the degree to which the peripheral deposition of potentially deleterious substances by mining activities in the mid-west of Western Australia impacts upon fauna health. The monitored presence of two EPBC-listed species, the Western Spiny-tailed Skink (*Egernia stokesii badia*) and the Malleefowl (*Leipoa ocellata*), within the operational area of the Karara Mining Ltd (KML) Iron Ore Project provides an excellent opportunity to assess these effects concurrently in both reptiles and birds (ecologically dominant fauna groups).

Project description:

We propose to collect blood, scats and biological samples from surrogate species, as well as potentially from the EPBC-listed species themselves, and analyse these samples for corticosterone (CORT), aldosterone and androgens, which are established biomarkers that can be used to interpret levels of short- and long-term stress. CORT analysis provides a relatively easy, low-cost, rapid way of assessing health individuals within populations over short and medium time periods, with the potential to make predictions about long terms trends. Collection of egg shells, feathers and other biological samples will allow us to quantify the uptake of cadmium and arsenic over both short and long terms, and collection of blood samples will provide data on oxidative DNA damage, indicating whether environmental contaminants have the potential to cause DNA damage to fauna. Biochemical markers of stress will be complemented by chemical analysis of scats, feathers and potentially body burdens on surrogate species which will inform on the potential bioaccumulation of elements by the key EPBC-listed species.

As the Malleefowl and Western Spiny-tailed Skink are recognised as conservation-dependent taxa under the EPBC Act, we propose to use sympatric surrogate species occupying similar ecological niches as proxies. Correlates between the priority species and the surrogates would be established, allowing for any observed impacts to be reliably inferred. The Common Bronzewing (*Phaps chalcoptera*) has been identified as a potential proxy for the Malleefowl, while the Peron's Snake-eyed (Fence) Skink (*Cryptoblepharus plagiocephalus*) could serve as a proxy for the Spiny-Tailed Skink. The adequacy of these species as surrogates will be determined in the first package of work.

The proposed research will reinforce the relationship between Curtin University and the mining industry - a key strategic positioning that will develop future opportunities for research funding. The proposed research will provide an important understanding of the cryptic impacts, if any, of mining operations upon native fauna. Critically, it will significantly enhance the existing monitoring undertaken by KML on EPBC-listed species within its operational footprint by providing a benchmark understanding of the health and behaviour of these species. This information will assist KML in meeting its ministerial conditions associated with assessing the impacts of mining on EPBC-listed species, and further establishes the company as a leader in science-driven best-practice ecological restoration

FEASIBILITY AND RESOURCING – DESCRIPTION OF THE SUPPORT THIS PROJECT WILL RECEIVE:

The project will have a considerable field-based component in the Karara mine site in the Pilbara. Karara mine has expressed a keen interest in this project and is willing to contribute a high level of logistical and site support for field work. The mine will provide a small financial assistance as a contribution towards the cost of biochemical marker analysis. Curtin has excellent Ecotoxicology labs to perform all biochemical marker analyses. The HDR student will be supervised by a multidisciplinary team that has the skills and expertise to cover all aspects of the project.

WHAT MINIMAL ATTRIBUTES AND SKILLS EXPECTED BY THE CANDIDATE BE COMPETITIVE:

Have a relevant Honours or MSc degree in environmental sciences or can demonstrate equivalence through work experience and/or publications. Can perform field work in isolated areas.

THE SIGNIFICANCE OF THE PROJECT/ PROGRAM FOR THE ENROLLING SCHOOL OR INSTITUTION:

The research will provide an understanding of the cryptic impacts of mining upon fauna and expand the remit of the CMSR and any future Restoration Ecology group within MLS from plants to EPBC-listed fauna. Critically, it will significantly enhance existing industry monitoring of EPBC-listed species within its operational footprint by providing a benchmark understanding of the health and behaviour of these species. The research will also allow MLS to make recommendations to the mining industry by providing a protocol to assess sub-lethal stress to animals, complemented with a biological toolkit to quantify stress levels in threatened species or their surrogates.

Students are advised to contact the Project Lead listed below prior to submission of their scholarship application to discuss their suitability to be involved in this strategic project.

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