HAMERSLEY IRON/CRA BIOGEOGRAPHIC STUDY IN THE WEST PILBARA

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INTRODUCTION AND ACKNOWLEDGMENTS.

Hamersley Iron invited us to examine the environmental work being conducted at Marandoo on their behalf by various consultants. We were on site on 11 and 12 June 1991. One of us (ANS) also attended a briefing (in Perth) addressed by members of the Curtin University team who are designing the study and by persons from Enviroscan.

We are grateful to Hamersley Iron for inviting us to visit Marandoo and for facilitating our trip. We are also grateful to all the consultants who gave time to make our review informative.

SCOPE

The **Marandoo Area Sampling Proposal** (Mulga Research Centre, Curtin University of Technology, May 1991) states on page 1 that the program has been developed to meet the following objectives:-

* "--to complete data collection for environmental assessment of the Marandoo tenement and the associated corridors"

* "--components of a broader exercise to encompass a biogeographical study of the general region."

* "--form the basis of longer term research into dynamic processes particularly effects of fire, disturbance and periodical flooding."

The first and last objectives relate to the Company's obligation to produce an ERMP for the Marandoo area. Over the years one of us (ANS) has informally discussed a range of topics related to potential environmental impacts of the Marandoo Project with several people including Ken Piggott. However the EPA has now issued guide-lines for the ERMP. CALM has had an opportunity to comment on a draft of the guide-lines and will have an opportunity to comment on the document on its completion.

Our current involvement with Hamersley Iron in relation to Marandoo does not concern these aspects of their environmental studies. It would therefore be inappropriate for us to comment on or criticise work being carried out to meet the requirements of the ERMP at this stage. Nevertheless we have offered to make data we hold on the area available and to discuss results at a scientific level.

The second objective, the biogeographic project, is the component with which CALM Research Division is involved. We hope to continue our close liaison role here because we see benefits to the State and the Company from developing a data set that is capable of providing a regional perspective to future decision-making about conservation and mining development issues.

We have communicated directly to Ken Youngson and Jan Henry (the principals of Ninox Wildlife Consulting; they were on site) certain modifications to the sampling design that would improve its usefulness in developing a regional biogeographical context. Of course the decision to adopt our suggestions remains the prerogative of Hamersley Iron and we made that clear to Ninox. We have not met with Libbie Matiske.

OBSERVATIONS

The following observations are relevant to the biogeographic aspects.

1. Sample site selection.

Jack Lorimer's Land units form an excellent basis for stratifying the sampling regime. The sites selected for the sampling seem to adequately represent the main land units that Jack has identified at the site, as well as the range of assemblages present on each land unit.

It is not apparent from the Curtin Sampling Proposal whether the site selection was based on the Lorimer units or derived independently. In any case, it is adequate. However all future site selections made as the project progresses should be firmly based on the Lorimer Land units.

2. Sample groups.

Plants, vertebrates and ants have been selected as the groups that will be sampled for the program. In the context of their current taxonomy, the range of species in each group and their amenability to survey, we agree that these are the logical groups to sample.

2. Quadrat Design.

The biogeographic analysis will require data-sets containing presence/absence information for each of the three groups that are to be sampled. Therefore the only usable sites will be those at which all three groups are sampled.

In developing these lists, consideration must be given to the heterogeneity in the assemblage being sampled. Heterogeneity can be caused by many factors such as co-occurrence/mutual exclusion and variability in topography, soil structure, nutrient availability and soil moisture.

2.1 Whilst the vegetation plot adjacent to each trap plot may serve the requirements of objectives other than the biogeographic project, the latter requires that the same site/plot is sampled for all groups. In the current design, heterogeneity in the assemblages could mean that the vegetation plot is not representative of all of the adjacent area from which animals are captured. Therefore presence/absence sampling for plant species should be extended to encompass the areas on which the vertebrates and invertebrates are being sampled.

The same principal applies to ant sampling. This additional sampling could be achieved by thoroughly searching the entire area to supplement the grid sample.

Because of their mobility and the relatively large size of the trapping plot there should be no need to modify the vertebrate plot design. However all vertebrates recorded on the ant and vegetation plots need to be incorporated into the site data set.

2.2 Noting our comments on heterogeneity and bearing in mind the relatively low biomass as well as climate-related fluctuations in animal numbers and plant status that are common features of arid areas, we are concerned that the plant and ant sample plots are small.

CALM data from Marandoo showed that 40X40m was an optimal quadrat size for sampling of perennials plants in a homogeneous assemblage. (Our study objective was such that we wanted to keep variability within our plots to a minimum while capturing as many as possible of the component plant species.)

In the present study it is highly desirable to represent what ever heterogeneity there is within each of the communities that is being sampled. This suggests that the floristic data needs to be collected from much larger quadrats than the vegetation plots prescribed in the Curtin Proposal.

We think that adoption of the proposal in 2.1 to extend the floristic presence/absence sampling over the vertebrate and ant plots would be enough to overcome this problem. Vegetation plots established in addition to the trapping sites need not be altered for this exercise since they are not suited to the biogeographic analysis anyway.

The same comments apply to ant sampling. However it may be necessary to extend the bird sampling beyond the plots because of the low density of birds, particularly in hummock grassland communities. However great care will be needed to ensure that in doing so, the sampling is restricted to the relevant land unit and vegetation type. It may be feasible to standardise bird work by controlling effort, centred as far as possible on the plots, but restricted in any case to the same land unit and habitat.

3. Pseodo-replication.

In arid areas species abundance, indeed species presence, can fluctuate with climatic conditions, particularly rainfall. Sampling that is based on a few, brief visits to relatively small quadrats is liable to overlook organisms that may be important to assemblage composition, at least in a biogeographic sense.

Therefore some duplication of quadrats is desirable It would provide a basis for assessing sampling success and point to point variation within the same land unit. In previous studies of semi-arid and arid regions that one of us (N.L.McK) has designed we sampled pairs of quadrats for at least one or two of the more widespread land units at each survey location within the Region we have been surveying.

We recommend that there is replication of at least two of the units that are being sampled at Marandoo. In a biogeographic context CALM is willing to provide data from its Marandoo study quadrats (where they are appropriate) to further improve the level of pseudo-replication. However the CALM project is designed to meet different objectives and so compatibility will not be good.

Conclusion.

We think that the sampling program initiated at Marandoo, subject to the modifications suggested here, provides a good basis for a successful biogeographic study of the west Pilbara Region given certain modifications. However the success of the project will depend on an adequate program of fieldwork and strict adherence to the selection of sample sites so as to adequately represent the range of heterogeneity in each of the

land units identified in the project area by the Lorimer study. The usefulness of the result will be proportional to the attention to detail put into the site selection, survey methodology and the analysis of the data.

However, if well done, the result will be of enormous benefit in so far as there will be a capacity to quantitatively and with confidence relate industrial project areas to the overall regional picture. It will also allow a fair degree of confidence in predicting biogeographic relationships when climatic conditions and time constraints are such that effective sampling is of limited value (Eg. after a long drought).