5.5. Haematology

5.5.1. Editor's Note

Considerable haematological work has been conducted as part of the WCRP. Unfortunately, much of it is not reported here. With the recent departure of Dr Phillip Clark from Murdoch University, his capacity to remain involved in the WCRP has also ceased. Dr Clark's contribution to the WCRP during 2006 and much of 2007 was highly valuable and integral to diagnostic disease investigations into the woylie declines, for which I am deeply grateful. His involvement and expertise are very much missed but we wish him the very best in is new persuits. Efforts are currently underway to address the resulting vacancy in haematological expertise.

Below is a copy of the haematology progress report extract from the Mesopredator Review, November 2006 by Phillip Clark. Further elaboration is provided by a short 2007 update courtesy of Paul Eden.

5.5.2. Haematology progress report extract from the Mesopredator Review, November 2006

Phillip Clark

Murdoch University

Blood samples were analysed from approximately 168 woylies from a number of locations. For the purpose of this report, the animals have been analysed as from 'Perup' or 'Karakamia'. Further analysis will become possible when animal identification data from each of the Perup transects becomes available. Overall, few (4 from Perup, 0 from Karakamia) animals exhibited haematological evidence of a distinct disease process (such as anaemia or inflammation). Data from these animals was excluded from the current analysis. The current analysis was generated using data collected from 130 animals (105 animals from Perup Data and from 25 animals from Karakamia). The dataset was incomplete in approximately 20 animals.

Notably, two haemoparasites were recognized. These were an intra-erythrocytic piroplasm (morphologically consistent with *Theileria penicillata* sp. nov., Clark and Spencer *in press*) and a previously unreported species of *Trypanosoma*.

Data were obtained from 25 animals from Karakamia. Of these, 95% (20 animals) had piroplasms visible in blood smears by light microscopy. However, trypanosomes were not visible by light microscopy in any of the samples examined.

Data was obtained from 105 animals from Perup, at a number of trapping transects. Piroplasms were visible in blood smears from 83% (87 animals) of the animals trapped, and *Trypanosoma* sp in 43% (45 animals).

Further work is being undertaken, using molecular biology methods to confirm the status/prevalence of the haemoparasites and to assess the phylogenetic characteristics of these organisms.

Statistical analysis

Animals that were considered to be unwell were excluded from the statistical analysis.

A Kolmagorov-Smirnof goodness-of-fit test was used to determine whether each variable was normally distributed for each population. All variables except band neutrophil concentration and basophil concentration were normally distributed.

For each analytes, a one-way ANOVA was used to compare the means of the two populations (Table 5.5.1). The Perup population had significantly greater total white blood cell concentrations ($p<0.001$), lymphocyte concentrations ($p<0.001$), monocyte concentrations ($p=0.002$) and eosinophil concentrations ($p=0.007$) than the Karakamia population. The Karakamia population had significantly greater MCH ($p<0.001$) and MCHC ($p<0.001$) than the Perup population.

Despite the observed statistical differences in the leukocytes, these do not clearly identify a distinct disease process and may be due to confounding influences on the leukocyte profile (such as 'stress' or excitement).

Table 5.5.1. Summary of analyte values for Perup [Upper Warren region] and Karakamia Wildlife Sanctuary.

Variable	Karakamia		Perup		p
	Mean	Range	Mean	Range	
WBC	3.44	1.5-7.8	5.35	1.3-11.5	<0.001
Lymph	1.53	0.4-4.1	2.45	0.3-7.8	<0.001
Mono	0.083	0.0-0.2	0.15	0.0-0.6	0.002
Eos	0.05	0.0-0.4	0.17	0.0-1.0	0.007
MCH	15.34	13.3-19.9	14.23	11.1-19.9	<0.001
MCHC	318	287-367	300	267-406	<0.001

5.5.3. Haematology update for 2007 in brief

Paul Eden

Perth Zoo

5.5.3.1. Introduction

This section follows on from ongoing work continued from a report by Dr Phil Clark (Murdoch University) from 2006.

5.5.3.2. Methods

Blood samples were collected from woylies following techniques as described in the WCRP Operations Handbook (Volume 3), and were examined using the standard haematological practices of Murdoch University Veterinary Hospital Clinical Pathology Laboratory. Samples were analysed by Dr Phil Clark and his associates. Samples were assessed for standard haematological parameters – packed cell volume (PCV, %), red blood cell count (RBC, cells $x10^{12}$/ml), haemoglobin concentration (Hb, mg/dl), white blood cell count (WCC, cells $x10^{9}$/ml), differential white blood cell count (heterophils, eosinophils, basophils, monocytes, lymphocytes, cells $x10^{9}$/ml) and platelets. Morphology of cells, including examination for red blood cell parasites, was also assessed. Samples examined included whole blood mixed with anticoagulant (EDTA) and air dried blood smears stained with Wright's/Giemsa stain.

5.5.3.3. Results

A total of 222 samples were analysed for haematology over the last twelve months, from samples collected in the Upper Warren region, PCS sites, Dryandra, Tutanning, Batalling and South Australia. (i.e. grand total of 511 samples from March 2006 to December 2007). Reference range information has previously been reported from a limited number of specimens by Dr Phil Clark (see Section 5.5.2. Haemotology Report 2006). This more recent data will be added to the haematology database and analysed in the near future to contribute to the strength of this reference information.

Further investigations regarding haemoparasites has been undertaken and is discussed elsewhere in this report.

5.5.3.4. Discussion

Reference haematological ranges are of value to investigate for evidence of clinical illness in sick and injured woylies, as well as to investigate possible subclinical effects of disease, however reference ranges are only of significant value in relation to the amount and quality data used to