Translocation Outcomes
for the Western Ringtail Possum

(*Pseudocheirus occidentalis*)

in the Presence of the Common Brushtail Possum

(*Trichosurus vulpecula*):

Health, Survivorship and Habitat Use

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B.V.Sc. (Hons), M.Sc. (Zoology)

This thesis is presented for the degree of Doctor of Philosophy of Murdoch University,

2011
In memory of “Theo”,

the western ringtail possum who, after being translocated from Busselton to Martin’s Tank, survived a long journey to Preston Beach township, only to meet death in the jaws of a fox after being translocated back to Martin’s Tank.

May we learn from the outcomes of our research.
I declare that this thesis is my own account of my research and contains as its main content work, which has not previously been submitted for a degree at any tertiary education institution

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Judith Rebekah Clarke
Abstract

The western ringtail possum, *Pseudocheirus occidentalis*, is classified as threatened, both nationally and internationally. Land clearing for building development threatens the last major coastal population stronghold in and around the town of Busselton in the south-west of Western Australia (WA). Translocation of displaced *P. occidentalis* from this locality into nearby conservation estates commenced in 1991, in the presence of fox control, with the aim of re-establishing populations of the species within suitable habitat outside its current range. Initial successes (1991-1998) were followed by a major population decline at one site for unclear reasons. The aim of this project was to determine which factors presently limit translocation success for *P. occidentalis* and thereby provide direction for future management of the species.

Displaced and rehabilitated *P. occidentalis* were translocated into three sites, two of which were baited for fox control. Survival was monitored weekly, causes of mortality were ascertained and attributes of habitat use were mapped and analysed. Each individual *P. occidentalis* underwent comprehensive health and disease screening under isoflurane anaesthesia prior to translocation and whenever recaptured for recollaring. Health, survivorship and habitat use of resident common brushtail possums, *Trichosurus vulpecula*, were similarly studied at each site. Pilot spotlight surveys using line transect methods were performed at the end of the study to provide provisional data on population densities.

Health screening revealed no evidence that infectious disease currently limits translocation success for *P. occidentalis*. Possums of both species were negative for toxoplasmosis, leptospirosis, salmonellosis and chlamydiosis. Cryptococcal antigen was detected in one individual *T. vulpecula* but was not of pathological significance. Endoparasite levels were negatively correlated with body condition. Differences between pre- and post-translocation haematological values were found, suggesting that habitat quality or nutrient intake were lower at the translocation sites than at the sites of origin.
Mortality rates of translocated *P. occidentalis* were high. The majority of *P. occidentalis* deaths were attributed to predation, with foxes, cats, pythons and raptors all implicated. Some *P. occidentalis* died in poor body condition from apparent hypothermia/hypoglycaemia, with moderate to heavy parasite burdens present at necropsy. Most *T. vulpecula* mortality was attributable to fox predation. Survivorship analyses were carried out using information-theoretic techniques to investigate which, if any, of a suite of hypothesised factors most influenced post-translocation survival of *P. occidentalis*. The most highly ranked models were those that included pre-release white blood cell counts and/or numbers of *T. vulpecula* at the release site. Survivorship of *P. occidentalis* was negatively correlated with each of these factors, and the two together acted in a synergistic fashion. Effects of fox control on *P. occidentalis* survivorship were equivocal. The average annual survival rate of established *P. occidentalis* was less than half that of resident *T. vulpecula*.

Post-translocation dispersal distances varied among individual *P. occidentalis*. Mean home range sizes of translocated *P. occidentalis* were larger than those reported for other coastal populations. Individual home ranges overlapped one another, both within and between possum species. Vegetation dominated by peppermint (*Agonis flexuosa*) was utilised by translocated *P. occidentalis* where available, and habitat partitioning between the two possum species was observed in some areas. A greater range of diurnal rest site types were utilised by *P. occidentalis* than *T. vulpecula*. Spotlight surveys revealed presence of low density *P. occidentalis* populations, including juveniles, at two sites but numbers remained negligible in the site at which the post-1998 decline had occurred.

Complex interactions involving health, predation, habitat quality and inter-specific competition influence the success or otherwise of wildlife translocation programs. The results of this project suggest that all these factors, particularly predation, affected translocation outcomes for *P. occidentalis* during the period of study. Complete exclusion of exotic predators (foxes and cats) from the translocation sites may be necessary in future, especially given the numbers of native predators (pythons and raptors) present. In addition to heavy predation pressure, the small size and apparently low carrying capacity of the translocation sites for *P. occidentalis*, along
with high numbers of resident *T. vulpecula*, currently appears to limit *P. occidentalis* survival and population growth.

While, in the short term, the most efficient use of funds and the best option for the species in its current coastal strongholds might be to put greater effort into conserving *P. occidentalis* in its natural environment, there could also be value in carrying out further experiments to determine whether or not translocation success can be improved through use of particular management actions. The principles of adaptive management apply both to management of *P. occidentalis* in its natural environment and to conduction of translocation programs. Possible experimental approaches are outlined and recommendations for further research proposed.
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Figure 6.22 Home ranges of *P. occidentalis* at Martin’s Tank during 2006-08 (yellow = female, orange = male), superimposed on location fixes from *P. occidentalis* translocated by Paul de Tores (unpublished data) in 2004-05

Figure 7.1 Maps showing spotlight transect lines at each field site

Figure 7.2 Data structure within Distance, showing the four levels of stratification (study area, region, line transect, observation), and ancillary data (covariates) at the transect and observation levels

Figure 7.3 Frequency distributions of perpendicular distances of observations from the transect line for all field sites combined; a) both possum species, b) *T. vulpecula*, c) *P. occidentalis*

Figure 7.4 Q-Q Plots of the EDF vs. CDF for the best models fitted to *P. occidentalis* spotlighting data. a) Non-truncated and b) truncated at 26 m

Figure 7.5 Uniform key function with one cosine adjustment fitted to a 10-bin histogram of the non-truncated *P. occidentalis* distance data

Figure 7.6 Half normal key function, scaled by vegetation density, fitted to 11-bin histograms of the truncated *T. vulpecula* distance data for each factor of the covariate

Figure 7.7 Density estimates for translocated and natural populations of *P. occidentalis* in coastal regions of south-west WA

Figure 7.8 Distance sampling density estimates for *T. vulpecula* at the translocation sites