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PLATYPUS POPULATION HEALTH IN A TASMANIAN RIVER CATCHMENT AND INFLUENCE OF LAND USE PRACTICES

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Introduction

This paper will use the example of a study of platypus population health in Tasmania, to highlight the opportunities available to practicing veterinarians to become involved with research aiming to assist the development of sustainable land use practices and conservation management plans.

Background

Platypuses are listed in the category of “Least Concern” in the International Union for Conservation of Nature Red List.[1] However, a wide variety of threats to platypus populations have been described and population declines and local extinctions have been observed.[2,3,4] Suggested threats to platypus populations include factors that affect platypus food sources or their ability to find suitable burrowing sites, such as bank erosion, loss of riparian vegetation, river sedimentation and flow regulation, as well as introduced species and disease.[2,3,4]

This includes the fungal disease mucormycosis, which has been observed in Tasmania, but not to date on mainland Australia. Mucormycosis in platypuses was first reported in 1983[5], and the causal organism was identified to be *Mucor amphibiorum* in 1993.[6] It causes cutaneous ulcers, sometimes lesions in other organs and death in a significant number of cases.[2,3,5,6]

Although many aspects of platypus biology and ecology are well understood, much less is known about the health of wild populations. Knowledge in this area is limited to: an understanding of some aspects of the fungal disease mucormycosis; a small amount of information about various other viral, bacterial, fungal, parasitic and non-infectious diseases; and observations on the influence of habitat on measures of population density.[2,3,4,7]

To date it has been difficult to quantify the magnitude of the various threats facing platypus populations.

This is largely a result of the difficulties associated with studying this cryptic species. Low recapture rates in field studies mean that it is rarely possible to observe the health/survival of individuals over time.

Also measures of population density such as capture rates and observational studies are unreliable in species such as the platypus, which are non-uniformly distributed, cryptic, net-shy and are found in low density populations. In addition, measures of population density do not necessarily equate to measures of population health as they do not assess whether population size is being maintained by local recruitment or whether individuals are migrating from elsewhere.

Aims

By studying a range of individual and population level parameters, this multidisciplinary project aims to overcome some of the difficulties associated with assessing the effects of specific threatening agents on platypus populations.

We are developing and applying a comprehensive framework to assess the health of platypus poplulations and address the following key issues: (1) whether infectious diseases and other threats to platypuses affect their health and longevity; (2) the relationship between environmental factors (such as land use and habitat disturbance) and disease; (3) whether platypuses migrate over periods of months/years; and (4) the factors that influence which individuals breed, and locations of breeding sites.

Methods

A team of researchers including wildlife veterinarians, epidemiologists, platypus biologists, ecologists, a wildlife geneticist and a diagnostic imaging specialist are collaborating to develop a broad population health assessment framework. The project involves a comprehensive field study in the Inglis catchment in Tasmania, to gather data on the health status of individual platypuses within this population. Fieldwork is being performed at sites at all levels of the catchment, in all seasons, over 24 months. This allows comparisons between individuals, locations, subcatchments, catchment levels, habitats and seasons; as well as monitoring changes over time.

Existing data relating to environmental factors (including geomorphology, hydrology, water quality, invertebrate analysis, land use and vegetation) in the subcatchments of the Inglis catchment have also been gathered. This allows investigation into links between platypus health and natural environmental factors/anthropogenic habitat disturbance.

Health and demographic data from individuals include: sex, age, body size, weight, body condition, serological evidence of mucormycosis, leptospirosis and toxoplasmosis, clinical signs/laboratory evidence of mucormycosis and other fungal/bacterial diseases, haematology and biochemistry parameters, reproductive status, and levels of internal and external parasites. Population-level research will include assessment of immunogenetic diversity which can influence the impacts of disease outbreaks; and a public survey of platypus sightings.

Platypuses are captured in either fyke nets or gill nets. Capture and handling follow standard research protocols(ref for protocols?). Platypuses are removed from nets by hand as soon as they are observed, and held in cotton sacks in a quiet place at the site of capture with adequate ventilation and protection from adverse weather conditions. Platypuses are examined under general anaesthesia, performed in the animals' natural environment. Once anaesthetized, a clinical examination is performed. Body weight and body morphometrics are measured.

Sex and age is assessed by the presence and morphology of the hindlimb spur. A blood sample is taken from the venous sinus in the bill. If clinical examination reveals a skin lesion consistent with mucormycosis, a range of samples is taken for laboratory analysis.

A 2mm diameter skin sample will be taken from the webbing of the back foot for immunogenetic analysis. If examination reveals the presence of ticks, a small number are removed using forceps for identification. A cloacal swab or excreta sample is taken to look for internal parasites and bacterial infections.

Body condition will be assessed using the tail volume index and external tail measurements.[8,9] Ultrasonographic measurements of tail fat are also made for comparison. Ultrasonography is also performed on the reproductive tract of adult platypuses to assess reproductive status.

Captured platypuses are individually identified by the implantation of a microchip. Platypuses are not removed from their natural environment at any stage and all processing is done on-site at the field location. They are released at the site of capture after all nets have been removed, which will avoid the possibility of individuals being captured in nets twice on the same night.

We are developing the use of a remote microchip reader system to monitor platypus movements. Microchip readers are placed at bottlenecks in smaller waterways where platypuses are likely to pass within the reader's range. Suitable small waterways are present at all levels of the Inglis catchment.[10]

Data from the readers are being used to assess long-term movements/migration of individuals as well as the relationship between the various health/disease/environmental parameters and the longevity of individuals captured in this study.

Results and Discussion

In the first six months of the project, 18 platypuses have been captured in 5 subcatchments within the Inglis catchment, consisting of 10 adult males, 7 adult females and 1 juvenile male. The average bodyweights of the adult males (2.1kg) and the adult females (1.4kg) have been similar to those of 10 adult male platypuses (average 2.1kg) and 11 adult female platypuses (average 1.3kg) captured in the same catchment in 2007-8 (Macgregor, 2008).

Scars have been observed on the tail or bill of 13 platypuses. Juvenile ticks have been observed on all 18 platypuses (average = 50), and adult ticks on three platypuses (average = 13, n = 3). No clinical signs consistent with mucormycosis have been observed. Coccidia-like oocysts have been observed in low numbers in the excreta of two platypuses. No other internal parasites have been detected.

Excreta from one male platypus contained moderate numbers of large (30µm) spiral bacteria which are yet to be identified. Excreta from another adult male contained thread-like structures, >50µm long, tapering at one or both ends, which were considered to be consistent with the tails of sperm with the acrosome lost.

Serological testing for the six Leptospira serovars most commonly identified in native? Tasmanian animals has been performed on samples collected from eight platypuses, with one platypus testing positive to *Leptospira interrogans serovar hardjo*. Serological testing for *Toxoplasma gondii* has been performed on samples collected from four platypuses, all of which were negative. Microscopy has been performed on blood smears from ten platypuses, with Trypanosomes found in nine and *Theileria* in eight.

A remote microchip reader has been trialled at two sites in separate waterways where platypuses have been captured.

At site A where two platypuses (platypuses 6 and 7) have been captured, platypus 7 has been recorded repeatedly moving past the reader over a three week monitoring period and platypus 6 has been recorded once. In addition, platypus 5 who had been captured at a site approximately 8km away one month previously has been recorded three times.

At site B where platypus 17 had been captured, this animal has been recorded moving past the reader every night over a two week monitoring period. Following these encouraging preliminary results, we plan to expand this movement monitoring aspect of the study.

We hope that with increasing numbers of platypuses microchipped during the study and using more remote microchip readers, we will provide important new insights into the movements of platypuses.

We anticipate that the combination of the movement, individual health and population level data gathered, and the environmental data collated, will greatly improve the understanding of the impacts of land use practices and disease on platypus populations.

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