Building a Wildlife Health Research Community: From Field to Pathogen Discovery

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INTRODUCTION
The Australian Registry of Wildlife Health is a program of the Taronga Conservation Society Australia, which conducts wildlife health research, disease investigation, and pathogen discovery. The Registry also operates as a wildlife health training and resource centre to contribute to enhancing our national diagnostic capacity.

Registry stakeholders are active, diverse, and collaborative. This research community is composed largely of academics and graduate students within veterinary colleges and biological science departments across Australia and New Zealand, yet also includes publicly funded scientists based at commonwealth and state government laboratories, commercial veterinary laboratories, zoos and non-government agencies. Illustrating the multi-faceted nature of wildlife health, the community also includes policy and program officers of state and commonwealth agriculture, environment and human health departments, essential to the implementation of research findings.

Wildlife health and disease are inextricably linked with human, livestock and environmental health, tourism and our global economy. Disease emergence from wildlife has been identified as the most significant and growing threat to global biosecurity[1,2]. New diseases are emerging from wildlife reservoirs to affect human health and biodiversity at the rate of approximately one each year and these diseases are spreading faster and further than ever before.

The wildlife health research community needs to identify emergent disease in wildlife, detect species declines prior to extinction, and understand the potential impacts of environment and climate change where there are geographically disparate data, resources, tools and expertise. In the past, pathogen discovery in wildlife has required as long as 19 years between detection and publication for chytrid fungus and 10 years for Tasmanian Devil Facial Tumour Disease. This must be changed if our collective resources are to have an effective impact on the health and functions of the ecological and economic systems upon which we rely.

THE PROJECT
In response to stakeholder demands for online access to the Registry’s extensive wildlife health data and assets, we partnered with Arcitecta Pty Ltd and the Australian Biosecurity Intelligence Network (ABIN) to build an online eResearch environment that addresses the threats and challenges listed above and provides our stakeholders with access to the following services within a secure, password protected environment:

- An online laboratory information management system that can be used by zoos and universities to manage their diagnostic data
- Access to the Registry’s 29,000 geotagged wildlife health data points, >5,000 images, 34 training videos, and teaching sets of digitised glass microscope slides representing exotic and endemic wildlife diseases
- A flexible geospatial asset and metadata management system – Mediaflux™ - that is easy to use and features drag and drop technology, access control, and universal search tools
- A community space with varied collaboration tools, including shared calendars and documents, RSS feeds, lists, forums, blogs, wikis, and announcements
- An Expertise and Resource Directory
- Web-conferencing and Web-seminar rooms

The wildlife health research community now has more than 205 members and continues to grow each month. This eResearch infrastructure supports existing relationships and collaboration networks, provides access to
valued content, and delivers valued services to all members. Programs such as monthly web-based Wildlife Health Rounds continue to build user participation and stakeholder engagement within and beyond the wildlife health sector.

Examples will be provided to illustrate how this eResearch environment is being used to improve the outcomes of emerging disease investigations, facilitate wildlife health research and to address critical skills shortages through training and continuing education of wildlife health researchers in Australia. We will demonstrate how wildlife health research outcomes are now more accessible within the wildlife health sector and to other beneficiary areas such as human health, environment and domestic animal health sectors.

Wildlife Health has become an exemplar of the benefits of changing work practices through collaborating within an eResearch environment and has become a tool for engaging members of other sectors.

The Future
To further address the threats posed by disease emergence from wildlife reservoirs, and to facilitate new research, we wish to expand this wildlife health eResearch system by:

- providing tools to more efficiently collect field based sensor data, ranging from geo-tagged surveys, audio files and images of wildlife at source and in real-time
- automating workflows to ensure the collection of high quality, standardised data and specimens
- incorporate predictive models of disease distribution and impact
- linking this system to other eResearch tools available through the Atlas of Living Australia and Genomic Virtual Laboratory.

These new capabilities will allow us to collect, share and analyse high quality, standardised data, address bottlenecks or barriers to collaboration, improve research efficiency, and open new areas of scientific investigation to wildlife health and ecology scientists.

The impacts of this science will be felt through more rapid detection and characterisation of diseases emerging from wildlife, better understanding of the impacts of environment and climate change on infectious and parasitic disease ecology, and providing accessible data to inform decisions on wildlife and ecosystem management.

References

About the Author(s)
Karrie Rose is a veterinary pathologist and manager of the Australian Registry of Wildlife Health at Taronga Conservation Society Australia. Karrie enjoys the collaborative and collegial nature of both the wildlife health and eResearch communities, and has a passion for pathogen discovery and uncovering the ecology of disease causing organisms.

Jason Lohrey is the Chief Technology Officer for Arcitecta and the creator of Mediaflux. He has worked with Taronga Conservation Society for the past five years and enjoys the collaboration. Jason is currently also working with the University of Melbourne and Monash University seeking to combine experimental methods with computational workflows. Mediaflux is used by a number of government, research and commercial organisations within Australia and overseas for managing a diverse range of data.

Mohammad Bhuyan is a Senior Software Engineer at Arcitecta. He is the primary developer of the Mediaflux based online laboratory management systems for ARWH. He has successfully delivered software solutions for a variety of domains – large-scale data management, HPC software solutions for research scientists, mobile applications for retail/service sector, business process automation for production industry and embedded systems for telecoms/internet systems.

Joanne Banyer is the CEO for the Australian Biosecurity Intelligence Network (ABIN), a Commonwealth funded National Collaborative Research Infrastructure Strategy initiative. ABIN is a secure virtual collaboration platform that services the online WildHealth eResearch environment.
Jane Hall is the Information & Resource Coordinator of the Australian Registry of Wildlife Health at Taronga Conservation Society Australia.