

PhD Dissertation Defense

Candidate: Karin Schwartz

Defense Date: November 17, 2014

Title: Integration of *In Situ* and *Ex Situ* Data Management for Biodiversity Conservation via the Isis Zoological Information Management System

Committee: Dr. Thomas Wood (Dissertation Director), Dr. Larry Rockwood, Dr. E.C.M. Parsons, and Dr. Jonathan Ballou (Smithsonian Institution)

ABSTRACT

For conservation action to mitigate biodiversity loss there is an increasing need for a “one plan approach” to develop multi-disciplinary conservation strategies that include the integration of *in situ* (in the wild) and *ex situ* (under human care in zoological facilities) management processes. This integration necessitates collaboration at all levels of conservation action including planning, implementation, monitoring and finally assessment to drive adaptive management processes. Each component of conservation action is fully dependent on the availability and accuracy of data to guide the formation of action plans and carry out management processes. The Zoological Information Management System (ZIMS), managed by the International Species Information System (ISIS), is a centralized Web-based system that pools data on global *ex situ* animal populations including basic information on life history, physiology, behavior, and health to facilitate animal husbandry and breeding management programs. ZIMS offers a new opportunity to link data management processes for animals that spend a part of their lives under human care and part in their natural environment, and potentially for monitored wild populations.

This dissertation has three main goals: 1) to identify data needed to manage and assess threatened species conservation programs; 2) to identify the data management tools currently in use by both *in situ* and *ex situ* partners for representative species recovery programs; and 3)

to develop the framework to expand the use of ZIMS by aligning the *in situ* and *ex situ* data needs with ZIMS functionality. First, published case studies of conservation translocations for representative invertebrate, fish, amphibian, reptile, bird, and mammal species were reviewed to identify parameters used in management and evaluation of success of the programs. Results showed that for all animal groups, important management and assessment parameters included basic data components on life history attributes, genetic diversity, habitat and resources, health assessments, husbandry and release methodologies, and long-term monitoring. Overriding themes included the lack of evidence-based information on life history, biology and ecology of the species and the need for scientific research for each step of the conservation translocation programs. Second, data collection and management tools were identified for five categories of threatened species programs, each in some way impacted by the integration of *in situ* and *ex situ* research or management. *Ex situ* species coordinators and registrars were consulted to identify data management practices for animals in zoological institutions and field researchers' data collection methods were investigated through direct observation or electronic communication. Overall data management processes included the use of ISIS programs and a combination of database programs (Access, Excel), Word documents, paper forms, and media (photos, videos, diagnostic images) such that compiling data for analysis was inefficient. Communication between *ex situ* and *in situ* partners required duplicate efforts in reporting resulting in lag times that compromised effective conservation action. Third, data requirements and data management tools for each program were aligned with ZIMS functionality to illustrate how this information system could integrate *in situ* and *ex situ* data management processes. Acknowledging that ZIMS has current functionality to cover many of the collective data management processes, limitations for comprehensive *in situ* data management were identified and recommendations were made for further development. Use of ZIMS can facilitate coordination of data management processes between conservation partners, thus improving the efficacy of biodiversity conservation programs.