



OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Develop STR/SNP panels (including any necessary allelic ladders and databases) for current species of forensic interest.

Keyword(s): STR panel, SNP panel, allelic ladder, standardization, development, game species, domestic species, livestock, wildlife

Submitting subcommittee(s): Wildlife Forensics **Date Approved:** 2/3/16

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Description of research need:

Commercially developed STR/SNP kits do not exist for wildlife species. Wildlife Forensic Laboratories, therefore, develop their own STR/SNP panels, either through original research or by adopting primers from the research literature. Laboratories then validate these panels in-house and construct associated databases for population frequencies. Because of this lack of centralized support, each laboratory completes this development of its own panel of STRs and its own database. Since allelic ladders are not typically developed for these panels, data are not transferrable between labs. This means that any databases that are developed can also not be shared.

While not all wildlife species need standardized STR/SNP panels, many labs would benefit from standardization of panels and development of associated allelic ladders for common game species such as North American deer species, moose, and bear; species of high international trade value (tigers, sturgeon, elephants); and commonly encountered domestic and livestock species (dogs, cats, horses, cattle).

Research and development, in this application, initially would involve developing sample databases which would then be used to identify and characterize genetic markers following these criteria:

- High discriminating power, usually greater than 0.9, with observed heterozygosity of greater than 70% (Butler)
- Separate chromosome locations to ensure that closely linked loci are not chosen (Butler)
- Robustness and reproducibility of results when multiplexed with other markers (Butler)
- Low stutter characteristics (Butler)
- Low mutation rates (Butler)
- Predicted length of alleles that fall in the range of 90-500 bp with smaller sizes better suited for analysis of degraded DNA (200 bp) (Butler)
- Ability to multiplex

Both existing markers and novel markers are possibly useful. Once the optimal marker panel has been developed for STR applications, an allelic ladder must be developed and made available to the relevant communities. Development of reference materials for these species is also needed. Development of the associated profile databases, either global or regional, whichever is applicable to the species of interest

is also necessary. All information must be made publically available for the relevant community. All panels must be developed with the intention of having a full validation completed that is compliant with OSAC Validation Standards.

2. Key bibliographic references relating to this research need:

Butler, J.M. 2010 Fundamentals of Forensic DNA Typing. Elsevier Academic Press, San Diego, 520 pages
Harper Cindy K, Vermeulen GJ, Clarke AB, de Wet JI, Guthrie AJ. 2013. Extraction of nuclear DNA from rhinoceros horn and characterization of DNA profiling systems for white (*Ceratotherium simum*) and black (*Diceros bicornis*) rhinoceros. *FSI Genetics* 7(4):428-433.
Jobin RM, Patterson D, Zhang Y. 2008 DNA typing in populations of mule deer for forensic use in the Province of Alberta. *Forensic Sci Int Genet* 2(3):190-7.
Rob Ogden, Nick Dawnay, Ross McEwing. 2009. Wildlife DNA forensics—bridging the gap between conservation genetics and law enforcement. *Endangered Species Research* 9(3):179-195.
Randy W. DeYoung, Stephen Demarais, Rodney L. Honeycutt, Robert A. Gonzales, Kenneth L. Gee and Joel D. Anderson. *Wildlife Society Bulletin*. 31(1):220-232.

3a. In what ways would the research results improve current laboratory capabilities?

Development and optimization of standardized panels, ladders, and databases would greatly reduce duplication of effort between laboratories and ensure continuity. Once the effort has been made, the databases cannot be shared and communication between laboratories is not possible. It would also improve quality by ensuring that each lab characterizes a minimum number of informative loci and uses similar terminology. Additionally, it would reveal landscape-wide population genetic structure that may not be apparent within only a single laboratory's regional-specific database.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

Database sharing will improve our understanding of population structure within target species across a larger geographic range. Standardization ensures that similar methods and terminology is used between laboratories.

3c. In what ways would the research results improve services to the criminal justice system?

Currently, most consumers must have testing done at whichever laboratory has the appropriate database for the needed species and population. If panels were standardized, databases could be built jointly and shared, and multiple labs would be able to provide services to consumers. The cost for development of panels and databases would be decreased. Additionally, standardized panels would ensure a minimum number of informative loci are used.

4. Status assessment (I, II, III, or IV):

I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III

Existing current research is being conducted	II	IV
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This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Approvals:

Subcommittee	Approval date:	2/3/16
<i>(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)</i>		

SAC				
1. Does the SAC agree with the research need?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
2. Does the SAC agree with the status assessment?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>
If no, what is the status assessment of the SAC:				
Approval date:	3/16/16			
<i>(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)</i>				