Scientific & Technical Review Panel Final Report for 2021-S-0014 Standard for Reference Collections in Wildlife Forensic Biology: Genetics and Vertebrate Morphology

Organization of Scientific Area Committees (OSAC) for Forensic Science

STRP Final Report
2021-S-0014
Standard for Reference Collections in Wildlife Forensic Biology: Genetics and Vertebrate Morphology

Organization of Scientific Area Committees (OSAC) for Forensics Science
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Scientific & Technical Review Panel Members

- Kelly Carrothers, California Department of Fish and Wildlife
- Peter Claussen, South Dakota State University
- Stephanie Domitrovich, State Trial Judge in Erie, PA
- Rachel Houston, Sam Houston State University
- Rebecca Johnson, Smithsonian National Museum of Natural History
- Christine Picard, IUPUI
- Adele Quigley-McBride, Duke University

Report Summary:

The Scientific and Technical Review Panel (STRP) for "Standard for Reference Collections in Wildlife Forensic Biology: Genetics and Vertebrate Morphology" is an independent panel appointed by the National Institute of Standards and Technology (NIST). A STRP is established with a range of experts to consider how well a standard meets the needs of the forensic science, law enforcement, and legal communities, and to recommend improvements to the standards under review. The STRP appreciates the efforts of Barry Baker, Wildlife Forensic Biology Subcommittee member, while serving as the subcommittee liaison to this STRP during the review process.

The STRP began its review process with a kickoff meeting on May 26, 2021 and concluded with this STRP final report. The panel reviewed the draft standard and prepared comments for the Wildlife Forensic Biology Subcommittee. The subcommittee considered those initial comments from the STRP and incorporated some suggested changes. This report highlights the STRP's opinion on the updated proposed standard.

Report Components:

The STRP reviewed this draft standard against OSAC's *STRP Instructions for Review* which include the following content areas: scientific and technical merit, human factors, quality assurance, scope and purpose, terminology, method description and reporting results. The details below contain a brief description of each reviewed content area and the STRP's assessment of how that content was addressed in the Draft OSAC Proposed Standard.

1. **Scientific and Technical Merit:** OSAC-approved standards must have strong scientific foundations so that the methods practitioners employ are scientifically valid, and the resulting claims are trustworthy. In addition, standards for methods or interpretation of results must include the expression and communication of the uncertainties in measurements or other results.

    1.1. Consensus View - The STRP believes this document has sufficient scientific and technical merit, and it will have a positive impact on the field of wildlife forensics by standardizing the requirements for addressing acquisition (4.1), verification of taxonomic identity (4.2), curation (4.3), and permanent removal (4.4) of wildlife forensic reference specimens. The bibliography also provides references for standards and scholarly publications that support activities in the proposed standard.

    1.2. Minority View – None.

2. **Human Factors:** All forensic science methods rely on human performance in acquiring, examining, reporting, and testifying to the results. In the examination phase, some standards rely heavily on human judgment, whereas others rely more on properly maintained and calibrated instruments and statistical analysis of data.

2.1. Consensus View - The STRP states that the human factors issues were addressed adequately in this proposed standard. This proposed standard establishes the necessary process and documentation required for formally developing and maintaining a wildlife forensics specimen reference collection. Section 4.2 (verification of taxonomic identity) of the proposed standard is the area where a potential human factors issues could arise. The proposed standard does note that not all reference specimens require identification to the species-level to be useful, which leaves discretion to the scientist. The proposed standard also requires documentation of important processes and data as part of the collection. This level of transparency is one way to keep track of any use of discretion and to mitigate the impact of human factors. The proposed standard also provides a minimum requirement for verifying the taxonomic identity of specimens, which does specify some methods that are considered appropriate to meet this minimum requirement. There are some limitations to these methods listed, though, as noted in the Method Description section of this STRP report, specifically—Sections 6.1 and 6.2.

2.2. Minority View – None.

3. **Quality Assurance:** Quality assurance covers a broad range of topics. For example, a method must include quality assurance procedures to ensure that sufficiently similar results will be obtained when the methodology is properly followed by different users in different facilities.

3.1. Consensus View – The STRP believes the quality assurance measures of the proposed standard are sufficient for promoting consistent application of the documentation and maintenance of wildlife reference specimens across forensic science service providers. There are, however, some problems noted by the STRP under the Method Description section of this STRP report that could result in some variations in quality (Sections 6.1 and 6.2), but these limitations would not result in the quality dropping below the minimum requirements described in the proposed standard.

3.2. Minority View – None.

4. **Scope and Purpose:** Standards should have a short statement of their scope and purpose. They should list the topics that they address and the related topics that they do not address. Requirements, recommendations, or statements of what is permitted or prohibited do not belong in this section.

4.1. Consensus View – The revised standard did not accommodate any recommendations broader than the previously approved scope which is limited to “Genetics and Vertebrate Morphology”. The STRP hereby registers its concern at the narrowness of the scope which does not reflect the breadth of collections (i.e., broader than vertebrates) that are encountered in this field and the analytical techniques (i.e., beyond genetics) that may be conducted on them.

4.1.1. Several suggestions offered by the STRP regarding the scope of the document were deemed not persuasive or not germane by the subcommittee. For example, the STRP recommended widening the scope of this document to include invertebrates. One of the primary reasons for this is the subcommittee will need to write a similar document to cover invertebrates and that document would likely be extremely similar, if not identical, to this draft standard. It would be inefficient to create a new, extremely similar standard for invertebrates and use NIST resources to put that document through the same review process when the current document could easily be edited to incorporate invertebrate morphology.

4.1.2. As an extension of the recommendation to widen the scope, if the subcommittee ultimately decides *not* to cover invertebrates or other categories of flora and fauna, this should ideally be expressed in the scope with a brief reason as to why this standard would not be appropriate for those types of reference collections (e.g., "...because reference collections for invertebrates require substantially different records, methods, and storage" or similar).

4.2. Consensus View - The revised standard did not accommodate any recommendations to reflect collections that are not “in-house”, which are sometimes used in case work (either as loaned specimens or genetic data not registered in house). The STRP would like to note this missed opportunity to provide guidance on use of such materials.

4.3. Consensus View - Further, the revised standard did not accommodate the non-permanent removal of reference specimens, such as a loan to another institution. Since some reference specimens are inherently difficult to obtain, loan systems can be a huge part of an ‘in-house’ reference collection. Again, the STRP would like to note this missed opportunity to provide guidance on use of such materials.

4.4. Minority View – A member of the STRP was pleased when this proposed standard was not broadened to encompass wildlife other than vertebrates (i.e., invertebrates, plants), as these sub-disciplines are specialized, and this would have taken a major revision to include. The need for any further justification for the exclusion of other taxa falls outside of the scope of this standard. Further, the STRP member serves as a member of a separate subcommittee, that is working on developing such standards with invertebrates (DNA, collections, etc.).

5. **Terminology:** Standards should define terms that have specialized meanings. Only rarely should they give a highly restricted or specialized meaning to a term in common use among the general public.

5.1. Consensus View – There were several instances where the STRP suggested clarifying some of the terms in the document, and the subcommittee did not

incorporate these changes because the wording was drawn directly from the OSAC Lexicon. Although the STRP recognizes that consistency within OSAC is important, unclear or ambiguous definitions should be edited. The subcommittee should revisit the definitions drawn from the OSAC Lexicon and consider whether any should be updated or need a sub-definition in the OSAC Lexicon.

5.2. Consensus View - In addition, the reference that was altered ("3.3 reference specimens") was edited so that it now seems even *less* clear. The STRP suggested an alternative definition: "Biological specimens of a known identity, including whole specimens, parts or derivatives of those specimens, genetic material obtained from those specimens, or data relevant to those specimens."

5.3. Minority View – None.

6. **Method Description:** There is no rule as to the necessary level of detail in the description of the method. Some parts of the method may be performed in alternative ways without affecting the quality and consistency of the results. Standards should focus on standardizing steps that must be performed consistently across organizations to ensure equivalent results. Alternatively, standards can define specific performance criteria that are required to be demonstrated and met rather than specifying the exact way a task must be done. For example, it may be enough to specify the lower limit for detecting a substance without specifying the equipment or method for achieving this limit of detection.

6.1. Consensus View – The STRP suggested editing Clause 4.2.3 ("*maintain a protocol for verification of taxonomic identity using standardized/published morphology or genetic methods that includes one or more of the following*:..."). There are four suggested methods listed within Clause 4.2.3 and use of only one is required to meet the standard. A key issue in forensic science, and one that OSAC has asked representatives on STRPs to prioritize, is the validation of methods in forensic disciplines. Statements about the adequacy of these suggested methods or the potential for error using these methods has not been addressed in the proposed standard, but it is clear from reading the list that they vary in their rigor, with point d) describing a method with less rigor.

6.2. Consensus View - The STRP requests the subcommittee revisit this list and include statements about the relative strength of these approaches and/or ask that more than one be used and/or require that the method of validation be recorded alongside the biological specimen and associated data so that the method used can be assessed by persons using the collection in the future. We recognize that there are times when d) is the only way to proceed with verifying the taxonomic identity of a biological specimen but, at a minimum, the standard should require that the managers of the collection be transparent about the methods used.

6.3. Consensus View - The subcommittee chose not to adopt a suggestion that the scope of a reference collection, as maintained and written by the laboratory or

entity managing the reference collection, should include a statement or statements about what their reference collection does *not* include. There are several reasons for this suggestion.

6.3.1. First, the scope should include descriptions of specimens, data, and items that are non-relevant and those that are relevant. Particularly given the subcommittee plans to exclude particular flora and fauna from the scope of this standard, what is *not* covered by the proposed standard should be clearly stated.

6.3.2. Second, clear definitions regarding what is covered by a proposed standard assists the person responsible for adhering to the scope when they are considering a new entry.

6.3.3. Third, if reasons for these exclusions are also included, this can be particularly informative to people managing the reference collection in the future, as the nature of the potential entries change with time.

6.3.4. Finally, should the responsibility pass on to someone else to decide what goes into the collection, the collection will continue to remain consistent if what is not included and the reasons are detailed explicitly in the written scope of the reference collection.

6.4. Minority View –The subcommittee addressed all relevant methods necessary for the reference collections in wildlife forensic biology: genetics and vertebrate morphology. The inclusion of multiple methods for identification in 4.2.3 should not be elaborated to include relative 'strengths' of the methods unless these have been explicitly addressed, compared, quantified and published in peer-reviewed literature. The subcommittee addressed clearly what is covered and not covered by this standard in the Scope section.

7. **Reporting Results:** Methods must not only be well described, scientifically sound, and comprehensive but also lead to reported results that are within the scope of the standard, appropriately caveated, and not overreaching.

7.1. Consensus View – The STRP agrees that the statements for reporting results are consistent with the scope and purpose of the draft standard. This is not a reporting standard; however, there are sufficient documentation requirements in the standard that detail how to document the acquisition (4.1), verification of taxonomic identity (4.2), curation (4.3), and permanent removal (4.4) of wildlife forensic reference specimens.

7.2. Minority View – None.