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## Wildlife Forensics Morphology Standards



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## Foreword

This document is intended to assist wildlife forensic practitioners in developing protocols and procedures that utilize best practices in the field of morphology.

Morphology is the study of form. In a wildlife forensic context, it is the discipline that uses physical comparison to identify wildlife parts and products, typically to the order, family, genus, or species source. Depending on the nature of the evidence, a variety of macroscopic and microscopic comparison techniques may be employed. Macroscopic examinations evaluate gross morphology seen without visual enhancement. Microscopic examinations are used to document details of external and/or internal structures and/or cross-sectional profiles of structures that are too small for gross external examination.

Most analyses performed by a forensic wildlife morphologist are based on class characters (e.g. general characters shared by a group of animals), not characters unique to a particular individual. Shared quantitative and/or qualitative morphological characteristics are used by scientists to specify or define taxonomic groups, such as orders, families, genera, and species. Frequently, morphological characters may be reliably associated with evolutionary lineages down to the species level. Individualization, in contrast, requires the recognition of characters that uniquely identify a specific individual. Individualization based on morphological characters is rarely attempted in wildlife cases.

Morphological comparison has been used for centuries as the basis for classic studies of biological structure and evolution, and is essential in the scientific work of taxonomists, anatomists, paleontologists, archaeologists, and forensic anthropologists. A substantial body of peer-reviewed literature exists that supports the scientific rigor and utility of morphological comparison techniques.

All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

**Keywords:** *wildlife forensics, taxonomic identification, reference collections, morphology, animal hair identification, feather identification, osteology, class characters*

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# Wildlife Forensics Morphology Standards

## 1 Scope

This document provides minimum standards for wildlife forensic analysts in the subdiscipline of morphology.

## 2 Normative References

The document contains no normative references. See Annex A, Bibliography for other references.

## 3 Terms and Definitions

For purposes of this document, the following definitions apply.

### 3.1

#### **analyst**

A qualified individual who conducts and/or directs the analysis of forensic casework samples, interprets data, reaches conclusions, and/or issues reports concerning conclusions.

### 3.2

#### **anthropogenic**

Relating to having origins in human activity.

### 3.3

#### **interspecific**

Occurring among different species.

### 3.4

#### **intraspecific**

Occurring within the same species.

### 3.5

#### **morphological**

Relating to a branch of biology that deals with the form of living organisms, and with relationships between their structures.

### 3.6

#### **reference material**

#### **reference specimen**

Biological specimens of known identity or data derived from them, or from published sources. Voucher specimens are a subset of reference material (see **voucher specimen**).

### 3.7

#### **taphonomy**

All of the processes resulting in the decomposition of organic material. Also pertains to the study of the processes affecting remains between death and discovery.

### **3.8**

#### **taxonomy**

The science of identifying and naming species with the intent of arranging them into a classification.

### **3.9**

#### **voucher specimen**

Biological specimen that is representative of its species in accordance with the relevant taxonomic authority. Voucher specimens are of known identity, and are curated with available associated geographic, field collection and life history data.

## **4 Requirements**

### **4.1 General**

**4.1.1** The analyst shall examine, interpret, and document morphological similarities between the evidence item and specimens of known species source, using additional information from scientific references, as appropriate.

**4.1.2** Instruments required for morphological measurements shall be subject to calibrations as recommended by the manufacturer, with documentation/records retained.

**4.1.3** The analyst shall consider the diagnostic value and inter- and intraspecific variability of the characters being analyzed.

**4.1.4** Scientific references used in morphological examinations shall be cited.

EXAMPLE Primary scientific literature, taxonomic monographs, morphometric datasets, dichotomous keys, field guides, and scientifically accurate (curated) image databases.

**4.1.5** The most relevant reference specimens shall be selected as appropriate, with consideration of:

- a) life history stage,
- b) sex,
- c) geographical origin,
- d) similar species.

**4.1.6** In making a taxonomic identification based on morphological characters, the analyst shall document the following in the bench notes:

- a) type of material received as evidence,

EXAMPLE Whole or partial organism, bone, tooth, feather, hair, ivory carving, leather, crafted item.

- b) intactness and condition of the evidence,
- c) morphological characters used to make the taxonomic identification,

- d) reference materials identified by taxonomic name and reference/catalogue number,
- e) data source(s) used to verify taxonomic identification.

**4.1.7** Bench notes and data interpretation shall follow the hierarchy of taxonomy, with characteristics of the order noted first, followed by family-specific characters, and finally those diagnostic to particular genera and species, as the evidence allows.

## **4.2 Process of Morphological Examination – External Remains**

**4.2.1** The analyst shall consider the completeness and condition of the evidence, and the presence or absence of taxonomically informative characters to determine the appropriate taxonomic level to which identification can be made.

**4.2.2** Evidence documentation shall begin with a detailed description and examination of the remains as submitted. This documentation may include a description of the shipping container and packing materials, and should include the physical condition in which the remains are received.

**4.2.3** Documentation shall include a description of the remains as they are received. This shall include a description of taphonomic indicators, and traits to assist in the establishment of the biological profile, to include sex, life stage, and age, as the evidence allows.

## **4.3 Process of Morphological Examination – Osteological Remains**

**4.3.1** Skeletonization shall not be undertaken without consulting the submitting agent/officer.

**4.3.2** Evidence documentation shall include a description of the osteological elements examined, their physical condition, and any taphonomic or anthropogenic alterations.

**4.3.3** If sufficient material is available, the analyst shall determine life history stage, such as adult, subadult, juvenile, or neonate, by evaluating age-informative characters for the taxon in question.

EXAMPLE Epiphyseal fusion of skeletal elements or relative completeness of dental eruption or wear in mammals.

**4.3.4** If sufficient material is available, the analyst shall determine the sex of the animal by evaluating sex-informative characters for the taxon in question.

## **4.4 Process of Morphological Examination – Microscopic Structures**

**4.4.1** Detailed examination of integumentary structures, such as hair and feathers, shall begin with documentation of gross features such as color, pattern, size, length and/or shape.

**4.4.2** Identifications shall be made based upon validated laboratory protocols for taxon-specific characters with documentation of:

- a) reference materials identified by structure (e.g. mounted hairs or feather barbs),
- b) taxonomic name and reference/catalogue number,
- c) data source(s) used to verify taxonomic identification.

## **5 Conformance**

Conformance to these standards is reflected in the documentation of criteria indicated in these standards.



## Annex A (informative)

### Bibliography

The references listed here include the key materials upon which these standards are based, and some additional references for context or specific issues covered. This is not intended to be an exhaustive list of relevant literature.

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