

Technical Report: SACON-WII/PR/296

**Taxonomic characterization of select Galliformes of India using feather morphometrics and DNA for application in wildlife forensics**

**ANRF Start-up Research Grant  
SRG/2022/000906**

**Principal Investigator  
Dr. Ashutosh Singh**

**Junior Research Fellow  
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**Sálim Ali Centre for Ornithology and Natural History  
(South India Centre of Wildlife Institute of India)  
Ministry of Environment, Forest and Climate Change  
Government of India  
Coimbatore - 641108, Tamil Nadu, India**



**अनुसंधान नेशनल रिसर्च फाउंडेशन  
Anusandhan National Research Foundation**



**भारतीय वन्यजीव संस्थान  
Wildlife Institute of India**



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**SEPTEMBER 2025**



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# Executive Summary

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Galliformes represents a highly diverse group of ground-dwelling birds that exhibit a wide range of habitats. These habitats include dense montane forests, alpine meadows, tropical and subtropical forests, dry deciduous woodlands, arid grasslands, scrublands, and even agricultural landscapes. This avian order is highly dependent on structurally complex habitats that offer adequate cover for nesting, foraging, and even escaping from predators. Habitat disturbances like deforestation, fragmentation, fire, grazing, and agricultural expansion reduce the availability of nesting sites, food resources, and shelter. Thus, this habitat loss also makes Galliformes more vulnerable to poaching, as they are forced to get closer to the human settlements. As a reason, Galliformes are frequently subjected to illegal hunting, particularly for their bushmeat, vibrant feathers, medicine, and ornamental value. Globally, the order Galliformes comprises over 306 species, among which India homes 43 species due to its varied ecosystems and habitats. Unfortunately, most of them face threats from illegal hunting and wildlife trade. Only feathers, eggs, and tissues are recovered in wildlife crime cases, making it difficult for correct identification of the species involved. This project addresses that challenge by building a comprehensive forensic database to identify Galliformes from even small or damaged biological samples. In this project, we studied 13 Galliformes species, out of which 8 species are Indian Galliformes and 5 species are exotic Galliformes. The list of 13 Galliformes species are as follows- Indian Peafowl (*Pavo cristatus*), Red Junglefowl (*Gallus gallus*), Grey Junglefowl (*Gallus sonneratii*), Kalij Pheasant (*Lophura leucomelanos*), Temminck's Tragopan (*Tragopan temminckii*), Himalayan Monal (*Lophophorus impejanus*), Cheer Pheasant (*Catreus wallichii*), Grey Peacock-Pheasant (*Polyplectron bicalcaratum*), Lady Amherst's Pheasant (*Chrysolophus amherstiae*), Golden Pheasant (*Chrysolophus pictus*), Silver Pheasant (*Lophura nycthemera*), Reeves's Pheasant (*Syrnaticus reevesii*), and Malayan Peacock-Pheasant (*Polyplectron malacense*). For feather database, we used a combination of both Light Microscope (LM) and Field Emission Scanning Electron Microscope (FESEM). The feather database provided information on the macroscopic as well as microscopic characteristics of 11 Galliformes species (Indian Peafowl, Red Junglefowl, Grey Junglefowl, Kalij Pheasant, Temminck's Tragopan, Himalayan Monal, Grey Peacock-Pheasant, Lady Amherst's Pheasant, Silver Pheasant, Golden Pheasant, and Reeves's Pheasant). The variation in macroscopic features of various feather types and microscopic structures examined under microscopes

are presented through a photographic plate database for comparison. The feather identification database can be useful for forensics purposes where, feathers are seized from the point of crime, and exact identification of species is not possible, or reliability towards molecular tool for identification is not feasible. For DNA database, non-invasive sample such as eggshell membrane and invasive samples such as blood, and tissue from 11 Galliformes species (*P. cristatus*, *G. gallus*, *L. leucomelanos*, *L. impejanus*, *T. temminckii*, *Catreus wallichii*, *L. nycthemera*, *C. pictus*, *C. amherstiae*, *S. reevesii*, *Polyplectron malacense*) were analyzed using mitochondrial DNA markers (Cytb, 12S rRNA, 16S rRNA, MCB). The successful amplification of two various methods such as Phenol Chloroform Isoamyl Alcohol (PCI) method and QIAGEN DNeasy Blood and Tissue (QDBT) method were compared. The resulting gene sequences were submitted to GenBank, making them accessible to enforcement agencies worldwide. For egg database, a total of 7 Galliformes species eggs (*G. gallus*, *L. leucomelanos*, *T. temminckii*, *L. impejanus*, *C. amherstiae*, *C. pictus*, *L. nycthemera*) were studied for their external morphology. A photographic plate along with morphometrics parameters (both qualitative and quantitative) for individual species are provided in the egg database. Multiple photographic orientations of eggs are provided for illegal egg trade cases, and also for field identification, and nest-monitoring of wild Galliformes. For ethnozoological practices of Galliformes, fieldworks were conducted in Darjeeling, West Bengal, and Koraput district of Odisha. Ethnomedicinal documentation of 8 Galliformes species (*P. cristatus*, *G. gallus*, *Gallus gallus domesticus*, *Galloperdix lunulate*, *Galloperdix spadicea*, *Coturnix coturnix*, *Perdicula erythrorhyncha*, and *Perdicula asiatica*) from Koraput and 4 Galliformes species (*P. cristatus*, *G. gallus*, *Gallus gallus domesticus*, and *L. leucomelanos*) from Darjeeling was documented. Along with ethnozoological practices, various hunting techniques for hunting Galliformes are described in detail. By combining feather characteristics, mitochondrial DNA barcoding, egg characteristics, and ethnozoological data, this research contributes a comprehensive forensic toolkit for species-level identification of Galliformes. The outcomes offer practical applications in enforcement, species conservation, and policymaking while highlighting the importance of integrating traditional ecological knowledge with modern conservation science.

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