

Article

Late Pleistocene and Early Holocene Birds of Northern Vietnam (Caves Dieu and Maxa I, Thanh Hoa Province)—Paleornithological Results of the Joint Bulgarian-Vietnamese Archaeological Expeditions, 1985–1991 (Paleoavifaunal Research)

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Abstract: The examined material (207 bones and bone fragments) of 53 avian taxa from two human cave dwellings is dated between $24,000 \pm 1000$ BP and 9400 ± 100 BP. It reveals that 49.0% of the bird species/taxa disappeared from the recent bird fauna of the Thanh Hoa Province; 39.6% disappeared from the recent bird fauna of North Vietnam (except Thanh Hoa Province); 33.9% disappeared from the recent bird fauna of Vietnam (except North Vietnam); 28.3% are not extant in the recent bird fauna of Indochina (except Vietnam); and 52.8% disappeared from the recent bird fauna of Southeast Asia (except Indochina). This suggests more considerable influence of the Late Pleistocene climatic events on the environment and bird fauna than previously accepted in the Eastern part of the Indochinese peninsula in the last 24–millenia. The gallinaceous birds are best represented. Of the 39 Southeast-Asian species, 18 species/taxa (46.2 percent) are Galliforms. They consist of 34 percent of all bird taxa recorded in both caves. Four categories of the IUCN Red List have been represented among the established birds in the sites: LC—28, NT—7, VU—2 (*Buceros bicornis* and *Rhyticeors undulates*), and CR—2 (*Lophura edwardsi* and *Rhinoplax vigil*).

Keywords: birds of Southeast Asia; late Pleistocene avifaunas; Quaternary paleoenvironment; fossil birds; Paleolithic Indochina; Northern Vietnam



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1. Introduction

The fossil avifauna of Vietnam is almost completely unexamined. Moreover, there are only several published studies on the Quaternary avian remains (Tommy Tyrberg, in litt.). The territory of this country, situated in the Eastern part of the Indochina Peninsula, remained almost unaffected during the Pleistocene glacial events in the Northern Hemisphere. Earlier summarizing studies ([1,2]) states that fossil birds are extremely rare in Southeast Asia, although most of them are of Pleistocene age. More recent similar research in the region [3] also reveals extremely scanty (single) avian fossils in Pleistocene assemblages.

Jones et al. [4] report on the first prehistoric archaeological record of Vietnam of the Greater Adjutant (*Leptoptilos dubius* Gmelin, 1789), the earliest record in Mainland Southeast Asia. Both hind limb bones (tarsometatarsus and a distal tibiotarsus) were found in the hunter-gatherer midden/cemetery site of the Con Co Ngua in Thanh Hoa Province, and date to c. 6000–5500 BP.

Meijer [5] summarizes data for over 54 genera and 27 families from the Eocene to the Holocene of Insular Southeast Asia. Although the great majority of these are of Pleistocene age, all explored sites (in Sumatra, Borneo, Quezon etc.) are far from the continental Indochina (and the territory of Vietnam).

The present bird fauna of South-East Asia is among the richest ones in the world. It contains 1227 [6] to 1251 [7] species. In this region, the Vietnam avian fauna is the most diversified and comprises 828 species [8,9]. Another source [10] lists 950 species of the

recent bird fauna of Vietnam. Only in South Vietnam, [11] contains 586 species. After Clements [12] the total country's fauna of birds numbers 950 species, of which 17 are endemic and 5 introduced.

Some preliminary data on the bird remains of the two examined caves have been published by [13].

2. Material and Methods

The material was collected during the Bulgarian-Vietnamese archeological excavations, carried out in 1985–1986 and 1988–1991 in the rocks in the Dieu Rock recesses (100 m a. s. l., 20°24'30" N, 105°16'20" E) in the valley of the Muong River (left tributary of the Ma River) in the Ba Tuk district of Tan Hoa province (North Vietnam). Nikolay Sirakov (Archaeological Institute and Museum, BAS—Sofia) and Hoan Suan Chin (Archaeological Institute, VAS—Hanoi) were the leaders of the Bulgarian and Vietnam teams, respectively. First excavation of the Dieu Cave has been started in 1930-ies by the French archaeologists, but no collected material has been preserved from these excavations in Vietnam [14].

The Joint Bulgarian-Vietnamese Archaeological Expedition found numerous tools dating the layers between 120,000 and 8000 BC, but the most numerous are those of 50,000–60,000 BP. The most recent findings of the Maxa I Cave belong to the s. c. Hòa Bình Culture (17,000–6000 BP). According to N. Sirakov, this region is one of the earliest centers of neolithization in the world [14].

The material originates from two Late Paleolithic—Early Holocene caves (Dieu/late Pleistocene/and Maxa I/Early Holocene) in the region of the valley of the upper stream of the river Ma, near to village Ba Thuoc (Thanh Hoa Province), 300 km SW of the town of Hanoi, near to the Laos border in Northern Vietnam.

The remains of animals suggest that the site was inhabited constantly by small groups of prehistoric people during the dry and humid seasons. The broken bones and signs of burning indicate remains of human food (kitchen debris) and indicate activities of food processing [15]. The population has been nourished by non-specialized hunting and gathering, exploiting various habitats in the vicinity of the rock shed.

Associated fauna: crustaceans—*Ranguna kimboiensis* Dang, 1975; terrestrial mammals—*Pongo pygmaeus* Linnaeus, 1760, *Tapirus* sp., *Rhinoceros* sp., *Maccaca* sp., *Muntiacus* cf. *muntjak* (Zimmermann, 1780), *Sus scrofa* Linnaeus, 1758, *Nemorhaedus* (pr. *Capricornis*) *sumatrensis* (Bechstein, 1799), *Talpa* (pr. *Euroscaptor*) cf. *macrura* (Hodgson, 1841), *Tupaia glis*, cf. *Trachypithecus* sp., *Hyllobates* (s. l.) sp., *Ratufa bicolor* (Sparrman, 1778), *Dremomys* sp., *Callosciurus* sp., *Petaurista petaurista* (Pallas, 1766), *Aeromys* sp., *Rhizomys pruinosus* Blyth, 1851, *Leopoldamys* sp., *Niviventer* sp., *Rattus* sp., *Hystrix* cf. *hodgsoni* (pr. *Hystrix brachyura* Linnaeus, 1758, ssp. *hogsoni*), *Atherurus* cf. *macrourus* (Linnaeus 1758), *Selenarctus* (pr. *Ursus*) *thibetanus* (G. Cuvier, 1823), *Martes* sp., *Arctonyx collaris* Cuvier, 1825, *Amblonyx cinerea* (Illiger, 1815), *Melogale personata* I. Geoffroy Saint-Hilaire, 1831, cf. *Chrotogale owstoni* (Thomas, 1912), *Paguma larvata* (Hamilton-Smith, 1827), *Paradoxurus hermaphroditus* (Pallas, 1777), *Prionodon pardicolor* Hodgson, 1842, *Viverra zibetha* Linnaeus, 1758, *Herpestes javanicus* (E. Geoffroy Saint-Hilaire, 1818), *Prionailurus bengalensis* (Kerr, 1792), *Axis porcinus* (Zimmermann, 1780), *Rusa unicolor* (Kerr, 1792), *Hydropotes inermis* (Swinhoe, 1870), *Nesolagus* cf. *timminsi* Averianov, Abramov and Tikhonov, 2000, and *Aeromys* sp. [15].

Lopatin et al. [16] established in the second half of the Middle Pleistocene and the beginning of the Late Pleistocene another cave (Lang Trang Cave) in the neighbor region of Northern Vietnam of more than 30 species of mammals, among them: “*Pongo* sp., *Trachypithecus* sp., *Macaca* cf. *nemestrina* (Linnaeus, 1766), and *Macaca* sp.; the carnivorans *Arctonyx collaris rostratus* Matthew et Granger, 1923 and *Panthera* sp.; the chiropteran *Ia io* Thomas, 1902; the rodent *Hystrix kiangsenensis* Wang, 1931; the proboscidean *Elephas* sp.; the perissodactyls *Tapirus indicus* (Desmarest, 1819) and *Dicerorhinus sumatrensis* (Fischer, 1814); the artiodactyls *Sus scrofa* Linnaeus, 1758, *S. barbatus* Muller, 1838, *Tragulus kanchil* (Raffles, 1821), *Hydropotes inermis* Swinhoe, 1870, *Muntiacus muntjak* (Zimmermann, 1780),

Axis porcinus (Zimmermann, 1780), *Rusa unicolor* (Kerr, 1792), and *Capricornis sumatraensis* (Bechstein, 1799)” (p. 1).

A total of 207 bird bones and bone fragments have been collected. According to the absolute radiocarbon analysis, the layers should refer to the late upper Pleistocene—the transition to Holocene. The dating of different cultural layers, containing avian bones, is between $24,000 \pm 1000$ BP. (Dieu Cave) and 9400 ± 100 years BP. (Maxa I Cave). Dr. Vassil Popov, a paleozoologist at the Institute of Biodiversity and Ecosystem Research, BAS, has collected the bone remains through the washing and sewing of cave deposits. According to Dr. V. Popov’s data around 8000 BC, the increasing humidity allowed for the abundance of water basins and water fauna (gastropodes, bivalves, crustaceans, and fishes).

The material has been identified through the comparative bird collections of the following institutions: NHMT (2002), CUCBL (1994–1995), NMNHS (2002, 2008, 2020–2021), and NMNHW (2002). All finds are kept at the Vertebrate Animals Department of the NMNHS (coll. Nos NMNHS 12316–2319; 12320–12345; 12347–12352; 12354–12373; 12375–12404; 12406–12409; 12411–12436; 12438–12446; 12447–12467; 12470–12479; 12481–12496; 12498–12500; 12502; 12504–12506; 12508–12512–12534; 12525–12530; 12569; 18640–18643;).

About one tenth of the findings represent unidentifiable remains (mainly without articular endings) of the avian long bones. Their details and measurements are given in Table 1. The manner of the measurements of all bone finding is presented on figures, included in Appendix A.

Table 1. Measurements of the unidentifiable remains (mainly without articular endings) of the avian long bones and their anatomical belonging.

Collection N	Taxa	Skeletal Element	TL	Appox. Size (of)	Maximum Diameter of Diaphysal Fragment
NMNHS 12526	Non-Passeriformes	tbt.	15.7		ca. 10.1
NMNHS 12521	Non-Passeriformes	ulna	10.5		3.2
NMNHS 12517	Non-Passeriformes	radius	19.0		4.9
NMNHS 12465	Non-Passeriformes	femur	18.6	<i>Arborophila</i> spp.	4.3
NMNHS 12520	Non-Passeriformes	ulna	19.2		3.8
NMNHS 12523	Non-Passeriformes	tbt.	29.0		ca. 10.3
NMNHS 12527	Non-Passeriformes	femur	16.6		4.8
NMNHS 12482	Non-Passeriformes	femur	31.7		4.2
NMNHS 12493	Non-Passeriformes	phalanx 1 dig. II pedis sin.	15.0		2.5
NMNHS 12439	Passeriformes	ulna sin	10.7	<i>Tephrodornis virgatus</i> Raffless, 1822	2.4
NMNHS 12515	Passeriformes	femur	5.8		2.2
NMNHS 12530	Passeriformes	ulna sin	12.0	<i>Trochalopteron milnei</i> (David, 1874)	2.2
NMNHS 12522	Aves indet.	femur	33.2		ca. 6.1
NMNHS 12412	Aves indet.	femur	9.7		3.6
NMNHS 12516	Aves indet.	tbt.	19.1		3.6
NMNHS 12511	Aves indet.	tbt.	18.0		3.6
NMNHS 12519	Aves indet.	humerus	12.9		3.8
NMNHS 12510	Aves indet.	femur	23.0		ca. 6.8
NMNHS 12514	Aves indet.	tbt.	17.8		ca. 3.6
NMNHS 12524	Aves indet.	femur	12.9		5.1

Taxonomy follows [17,18]. The osteological terminology follows that of [19–21]. All measurements are given in millimeters.

In the osteological comparison sections of the species accounts, when the following is written: (1) “*Tragopan satyra*”, it should be read: “[The compared fossil specimen differs from] *Tragopan satyra* by: . . . ”. All generic names of the binominals are given abbreviated in the text and in full in the subtitles and the tables. (2) “Smaller” or “much smaller” and “larger” or “much larger” mean that the fossil specimen considerably differs in size from the specimens of the compared species and due to these significant differences (and the presumed morphological ones), the taxonomical identity is excluded. A reference to the relevant table of the value of the measurements is given at the end of the comparison of each bone find.

3. Systematic Paleontology

3.1. Galliformes Temminck, 1820

3.1.1. Phasianidae Horsfield, 1821

It is listed [22] a total of 22 taxa of Phasianidae (the most numerous/and possibly most exploited by the prehistoric people/ avian family among the collected findings) from China, which is the country of the best studied fossil and subfossil bird fauna in East Asia: *Alectoris chukar*, *Alectoris peii*, *Bambusicola* sp., *Bambusicola thoracica*, *Bonasa daliensis*, cf. *Chrysolophus pictus* *Chrysolophus amherstiae*, *Coturnix coturnix*, *Coturnix* sp., *Crossoptilon jiai*, *Crossoptilon* sp., *Francolinus pintadeanus*, *Perdix* cf. *perdix*, *Perdix dauurica*, *Perdix paleoperdix*, *Perdix* sp., *Phasianus colchicus* *Phasianus* sp., *Phasianus yanshensis* *Phasianus*/Gallus sp., *Pucrasia macrolopha*, and *Tragopan temminckii*. Only four of them are fossils: *Alectoris peii*, *Crossoptilon jiai*, *Perdix paleoperdix*, and *Phasianus yanshensis*. They all originate from localities in NE China, a rather remote region from Thanh Hoa Province of N Vietnam. *Phasianus yanshensis* is known by a skull [23] and thus it is uncomparable with the examined material. *Perdix* (incl. *P. paleoperdix*) is not presented in the studied material. *Alectoris peii* was an early Pleistocene species [24]; i.e., 2.580 to 0.773 Ma), which is a significant chronostratigraphic difference.

Lophura diardi (Bonaparte, 1856) Siamese Fireback

Endemic. Uncommon to locally common resident NW (eastern), NE, SE Thailand, Indochina except W, E Tonkin [7] (Supplementary Materials, Map 1). IUCN—LC. Coracoid omal part. sin., NMNHS 12347 (Figure A10c) *Lophura diardi*, AB 21, Dieu. TL: 24.4. *Tragopan satyra*: slender; not robust, diaphysis. *Lophophorus impejanus*: absence of a protuberance in the caudal direction of pr. acrocoracoidalis. *Chrysolophus pictus*: more protruded f. a. humeralis. *Lophura ignita rufa*: thinner diaphysis and narrower f. a. humeralis. *Lophura erythrophthalmus*: larger size; lesser concavity of the f. a. humeralis. *Lophura nycthemera*: medial slope in the distal part. Identity with *Lophura diardi* (Table 2; Appendix A, Figure A1a).

Table 2. Measurements of coracoid (scapular part) of fossil and recent Phasianidae (Ref. to Figure A1a; a—maximum width; b—minimum width; c—diagonal width at f. scapularis).

Species	a	b	c
Fossil—Dieu			
<i>Lophura diardi</i> NMNHS 12347	7.2	4.9	8.7
<i>Lophura edwardsi</i> NMNHS 12397	5.2	3.6	6.7
<i>Lophura</i> aff. <i>nycthemera</i> / <i>Lophura edwardsi</i> <i>hatinhensis</i> NMNHS 12356 (414)	6.8	5.2	7.4
<i>Gallus gallus</i> NMNHS 12398	6.5	4.5	8.2
Recent			

Table 2. Cont.

Species	a	b	c
<i>Lophura diardi</i> NHMT 1976.32.3	6.7	3.1	7.4
<i>Lophura diardi</i> UCBL (no number)	7.3	5.3	8.9
<i>Lophura edwardsi</i> NHMT 1997.47.1	5.7	4.0	7.0
<i>Lophura leucomelanos</i> NHMT 1865. 10.9.19	ca. 8.3	3.6	ca. 8.6
<i>Lophura nycthemera</i> UCBL (no number)	6.1	4.5	7.2
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	-	4.0	ca. 7.0
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	5.8	4.5	7.8
<i>Lophura erythrophthalmus</i> NHMT 1952.2.103	-	4.4	ca. 6.5
<i>Lophura swinhoii</i> NHMT 1966.55.36	6.3	4.4	6.7
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.7	3.3	5.5
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.3	2.8	4.8
<i>Syrnaticus ellioti</i> MNHNP 1901/91	5.5	4.6	7.8
<i>Lophophorus impejanus</i> UCBL (no number)	7.7	6.2	9.2
<i>Chrysolophus pictus</i> UCBL (no number)	4.7	3.5	5.8
<i>Crossoptilon auritum</i> NHMT 1868.9.12.23	8.6	5.2	7.4
<i>Crossoptilon auritum</i> UCBL (no number)	6.6	4.8	8.7
<i>Alectoris graeca</i> NHMT 1868 9.12.13	5.2	3.5	6.3
<i>Gallus gallus</i> NHMT 1868.2.19.59	6.0	4.4	7.1
<i>Gallus gallus</i> UCBL 454/1	6.4	4.4	7.5
<i>Gallus gallus</i> UCBL 454/3	5.8	4.1	6.7
<i>Gallus gallus</i> UCBL 454/4	4.5	5.4	7.6
<i>Tragopan satyra</i> MNHNP 1884/330	4.5	5.4	7.6
<i>Tragopan satyra</i> NMNHT 2000.14.7	6.8	5.3	8.4

Tbt. dist. sin., NMNHS 12330 (Figure A10a,b) *Lophura diardi*—Dieu: *Crossoptilon*: shorter p. stn. TL: 17.1. *Syrnaticus ellioti*: smaller epicondylus med.; more concave condylus med.; perpendicular, but not sharp axis of the tr. tibiotarsi towards the longitudinal axis of the diaphysis. *Tragopan caboti*: absence of epicondylus med.; shallower tendineal groove distally on the lateral surface. *Polyplectron germaini*: bigger size; gradual transition between distal diaphysis and the epiphysis. *Lophuranycthemera*: narrower distance between the condyles. Completely corresponds to *Lophura diardi* (Table 3; Figure A1b).

Tbt. dist. sin., NMNHS 12376 (Figure A10g,h) *Lophura diardi*. Dieu. TL: 19.9. *Crossoptilon auritum*: deeper incisura intercondylaris; shorter p. stn. *Lophophorus impejanus*: more concave p. stn.; shorter epicondylus med. *Syrnaticus reevesi*: less developed tuberculi retinaculi musculus fibularis. *Polyplectron bicalcaratum*: more flattened (concave) p. stn. *Chrysolophus pictus*: relatively bigger diameter of the condylus lateralis in comparison with the condylus med. *Gallus gallus*: more upright distal edge of condylus med. in the ventral view. *Syrnaticus ellioti*: metrically; deeper intercondylar space; smaller epicondylus med.; the more concave p. stn. *Phasianus colchicus*: larger size (adult male compared); larger lower opening under p. stn.; more caudal position of the edge constriction on the condylus lateralis. *Rheinardia ocellata*: thicker distal diaphysis; wider p. stn. *Argusianus argus*: thicker distal diaphysis and narrower incisura intercondylaris. *Tragopan temminckii*: close; wider and longer p. stn.; less developed (or absent) tuberositas retinaculi musculus fibularis. *Tragopan satyra*: relatively thicker distal diaphysis, narrower distal epiphysis; wider p. stn. *Lophura nycthemera*: longer p. stn.; deeper incisura intercondylaris. *Lophura dardi*: completely corresponds to this species, but the fossil spec-

imen shows less developed epicondylus med. (more specifically, it is not developed at all) (Table 3). Tmt. dist. dex., NMNHS 12413 (Figure A10d) *Lophura diardi* Dieu. TL: 26.1. *Chrysolophus pictus* and *Polyplectron bicalcaratum*: metrically; more flattened (open) distal epiphysis. *Lophura nycthemera*: larger angle between axes of tr. e metatarsi II and IV. *Syrmaticus reevesi*: metrically; lesser asymmetry of tr. mt. IV. *Crossoptilon auritum*: more massive tr. mt. IV. *Lophophorus impejanus*: smaller tr. mt. II and narrower foramen vasculare distale. *Lophura edwardsi* and *Lophura hatinhensis* are smaller in size [9,25]. *Lophura ignita rufa*: rounder profile of the lateral view of the tr. mt. II. *Gallus gallus*: larger angle between the axis of tr. mt. II and of tr. mt. II (i.e., the more flattened distal epiphysis). *Syrmaticus ellioti* has more concave distal epiphysis. Identical in morphology with *Lophura diardi* (Table 4; Figure A1c).

Table 3. Measurements of tbt. dist. of fossil and recent Phasianidae (Ref. to Figure A1b).

Species	a	b	c	d
Fossil—Dieu				
<i>Gallus gallus</i> NMNHS 12393	9.7	ca.8.6	10.0	ca. 11.7
<i>Gallus gallus</i> NMNHS 12396	-	9.0	10.5	-
cf. <i>Gallus gallus</i> NMNHS 12395	-	7.4	-	9.3
<i>Lophura diardi</i> NMNHS 12330	ca.9.6	-	10.5	-
<i>Lophura</i> cf. <i>diardi</i> NMNHS 12414	12.1	-	-	12.3
<i>Lophura</i> cf. <i>nycthemera</i> NMNHS 12348	-	11.5	12.4	-
<i>Lophura</i> cf. <i>nycthemera</i> NMNHS 12358	11.0	9.6	-	11.9
Phasianidae NMNHS 12376	11.9	ca. 10.4	11.6	12.6
<i>Arborophila</i> sp. NMNHS 12317	7.1	ca. 5.6	6.3	6.6
<i>Gallus gallus</i> NMNHS 12377	9.6	7.3	9.3	9.3
Phasianidae NMNHS 12485	9.0	ca.7.4	9.0	9.2
Phasianidae NMNHS 12424	11.6	9.4	11.4	11.6
Recent				
<i>Phasianus colchicus</i> NHMT 1998.28.1	9.9	7.7	9.3	10.7
<i>Phasianus colchicus</i> NHMT 1999.43.207	11.2	9.2	11.0	11.9
<i>Crossoptilon auritum</i> NHMT	15.0	12.0	13.7	15.2
<i>Crossoptilon auritum</i> UCBL (no number)	11.6	11.1	11.7	12.8
<i>Lophura nycthemera</i> NHMT 1984.75.1	11.7	9.5	10.2	11.4
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	12.0	11.1	12.5	14.5
<i>Lophura leucomelanos</i> NHMT 1976.32.3	10.5	8.5	9.5	10.1
<i>Lophura leucomelanos</i> NHMT 1865.10.9.19	10.6	8.2	9.3	10.3
<i>Lophura nycthemera</i> UCBL (no number)	11.2	8.5	9.8	10.5
<i>Lophura diardi</i> NHMT 1976.32.3	10.4	8.8	10.2	9.3
<i>Lophura diardi</i> UCBL (no number)	12.6	10.9	11.4	12.0
<i>Lophura impejanus</i> NHMT 1977.19.1	15.2	12.9	13.0	13.6
<i>Lophura swinhoi</i> NHMT 1966.55.36	11.0	9.1	10.0	11.3
<i>Lophura erythrophthalmus</i> NHMT 1952.2.103	9.3	7.9	9.0	9.8
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	9.5	7.9	8.9	10.1
<i>Syrmaticus reevesi</i> UCBL (no number)	8.3	6.5	8.1	8.6

Table 3. Cont.

Species	a	b	c	d
<i>Syrmaticus mikado</i> NHMT 1975.40.1	11.4	8.3	9.2	10.0
<i>Syrmaticus ellioti</i> NHMT 1994.63.2	10.8	9.0	9.3	10.0
<i>Syrmaticus ellioti</i> MNHNP 1901/91	8.8	7.2	8.1	9.0
<i>Tragopan caboti</i> MNHNP 1907/212	10.6	8.3	19.9	11.0
<i>Tragopan satyra</i> NHMT 2000.14.7	13.0	11.2	12.2	12.9
<i>Tragopan temminckii</i> NHMT 1976.1.1	11.7	10.0	11.0	12.0
<i>Lophophorus impejanus</i> UCBL (no number)	13.7	11.2	11.4	12.5
<i>Chrysolophus amherstiae</i> NHMT 1980.2.1	10.0	8.8	9.3	9.8
<i>Chrysolophus pictus</i> NHMT 1966.29.4	8.1	7.2	7.3	8.3
<i>Chrysolophus pictus</i> UCBL (no number)	8.2	7.1	7.8	8.8
<i>Gallus gallus</i> UCBL 454/3 (no number)	10.8	8.7	9.1	10.3
<i>Gallus gallus</i> UCBL 454/4 (no number)	9.2	7.9	8.3	9.2
<i>Gallus gallus</i> NHMT 1999.43.34	11.2	9.8	11.4	13.1
<i>Gallus gallus bankiva</i> UCBL 454/1	10.5	8.2	9.5	10.7
<i>Argusianus argus grayi</i> NHMT 1900.7.6.23	12.1	9.4	11.6	12.6
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	12.2	8.8	11.3	12.2
<i>Melanoperdix nigra</i> NMNHW 321114	6.0	4.6	6.3	5.8
<i>Arborophila brunneopectus</i> NMNHW 491868	8.7	3.7	4.0	4.8
<i>Arborophila javanica</i> NHMT 1850.8.15.69	6.9	6.5	6.6	7.4
<i>Francolinus francolinus</i> NHMT 1972.1.157	7.7	6.4	7.3	7.7
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	12.9	11.6	12.6	14.6
<i>Alectoris rufa</i> NHMT 1999.43.214	7.4	6.9	6.6	7.3
<i>Polyplectron germaini</i> NHMT 1977.98.1	6.9	5.7	7.4	7.4
<i>Polyplectron bicalcaratum</i> UCBL (no number)	8.0	6.3	7.5	8.3

Cmc. dist. sin., NMNHS 12473 (Figure A10k) *Lophura diardi*. Dieu. TL: 21.8. Dimensions suggest Phasianinae. *Lerwa lerwa*: smaller; os metacarpale majus and os metacarpale minus parallel in their distal ends. *Chrysolophus pictus*: larger; deeper relief of f. a. digitalis major. *Chrysolophus amherstiae*: smaller f. a. digitalis major. *Polyplectron bicalcaratum*: metrically and rigther axis of os metacarpale majus. *Polyplectron germaini*: much larger. *Syrmaticus mikado*: wider distal part of cmc. *Syrmaticus soemmerringii*: thicker distal third of os metacarpale majus. *Syrmaticus ellioti*: shorter and less prominent f. a. digitalis minor. *Syrmaticus reevesii*: metrically and absence of the tendineal bridgelet. *Lophophorus impejanus*: metrically and less prominent f. a. dig. 3. *Chrysolophus auritus*: shorter synostosis metacarpalis dist. (measurement "c"). *Gallus gallus*: smaller angle between os metacarpalis majus and os musculus minus in the cranial view on the distal f. a.; longer synostosis metacarpalis dist. *Tragopan satyra* and *Tragopan temminckii*: smaller f. a. digitalis major. *Rheinardia ocellata*: smaller f. a. digitalis major. *Argusianus argus*: less caudally prominent f. a. digitalis minor. *Ithaginis cruentus*: less caudally prominent f. a. digitalis minor. *Pucrasia marcolopha*: thicker distal end of os metacarpalis major; more caudally directed os metacarpalis minor. *Phasianus colchicus* and *Lophura leucomelanos*: longer synostosis metacarpalis dist. *Lophura nycthemera*: almost twice as small f. a. dig. 2. *Lophura swinhoi*: protruded, not flattened f. a. digitalis minor. *Lophura diardi*: considerable similarity (Table 5; Figure A1d).

Table 4. Measurements of tmt. dist. of fossil and recent Phasianidae (Ref. to Figure A1c).

Species	a	b	c
Fossil—Dieu			
<i>Lophura nycthemera</i> NMNHS 12332	5.0	5.6	-
<i>Lophura diardi</i> NMNHS 12413	ca. 5.6	6.9	5.3
<i>Arborophila brunneopectus</i> NMNHS 12392	3.4	3.8	3.0
<i>Arborophila torqueola</i> NMNHS 12500	3.0	3.4	-
<i>Lophura</i> cf. <i>diardi</i> NMNHS 12415	5.3	ca. 6.5	-
<i>Arborophila</i> sp.- 2 NMNHS 12391	3.2	3.5	3.4
Phasianidae NMNHS 12334	5.3	6.6	Ca. 6.4
<i>Arborophila brunneopectus</i> NMNHS 12390	3.4	4.1	3.0
Recent			
<i>Arborophila javanica</i> NHMT 1850.8.69	3.6	4.1	3.1
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	3.5	3.7	2.7
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	2.9	3.5	2.6
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	2.9	3.6	1.9
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	3.0	-	2.4
<i>Rollulus roulroul</i> NHMT 1973.66.63	2.7	3.2	2.7
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	2.4	3.3	2.1
<i>Francolinus francolinus</i> NHMT 1972.1.157	3.2	3.5	2.8
<i>Francolinus pintadeanus</i> NMNHW 343198	3.4	4.2	3.0
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	3.7	2.7	2.9
<i>Perdica asiatica</i> NHMT 1868.9.12.8	1.8	-	1.5
<i>Francolinus pictus</i> NHMT 1896.2.16.47	3.1	3.8	2.3
<i>Perdix dauurica</i> NHMT 1930.3.24.29	2.8	3.6	2.6
<i>Perdix perdix</i> NHMT 1962.21.1	2.4	3.4	2.6
<i>Lophura diardi</i> NHMT 1976.32.3	4.8	5.5	4.2
<i>Lophura diardi</i> UCBL (no number)	5.2	6.2	3.7
<i>Lophura swinhoi</i> NHMT 1966.55.36	5.2	6.2	5.4
<i>Lophura nycthemera</i> NHMT 1984.75.1	5.2	6.2	3.9
<i>Lophura nycthemera</i> NHMT 1951.12.3.11	5.5	6.6	3.2
<i>Lophura nycthemera</i> UCBL (no number)	4.6	5.5	3.1
<i>Lophura leucomelanos</i> NHMT 1865.10.9.19	4.4	5.4	4.2
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	5.8	7.7	5.2
<i>Lophura "imperialis"</i> NHMT 1977.19.1	6.5	7.6	5.3
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	4.2	5.4	3.7
<i>Pavo muticus</i> NHMT 1952.2.34	7.8	-	7.0
<i>Crossoptilon auritum</i> UCBL (no number)	5.4	6.6	3.2
<i>Polyplectron bicalcaratum</i> UCBL (no number)	3.7	4.7	2.7
<i>Syrnaticus reevesi</i> UCBL (no number)	3.7	4.9	2.7
<i>Syrnaticus ellioti</i> NHMT 1994.63.2	4.8	6.1	4.2
<i>Syrnaticus ellioti</i> MNHNP 1901/91	3.7	5.1	3.2
<i>Syrnaticus soemmerringii</i> NHMT 1860.8.25.7	ca. 4.5	-	4.0
<i>Tragopan temminckii</i> NHMT 1976.1.1	5.1	-	5.0
<i>Tragopan satyra</i> NHMT 2000.14.7	6.0	6.9	4.6
<i>Tragopan caboti</i> MNHNP 1907/212	4.7	5.9	3.0
<i>Argusianus argus grayi</i> NHMT	5.0	6.4	4.3
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	4.8	6.9	3.7
<i>Alectoris graeca</i> NHMT 1952.2.48	3.6	4.6	2.9
<i>Lophophorus impejanus</i> NHMT 1977.19.1	6.6	7.8	5.3
<i>Lophophorus impejanus</i> UCBL (no number)	6.3	7.3	4.0
<i>Chrysolophus pictus</i> UCBL (no number)	3.9	4.7	3.9
<i>Chrysolophus pictus</i> UCBL 131/5	4.3	5.4	3.6
<i>Phasianus colchicus</i> NHMT 1999.43.207	5.2	6.8	4.2
<i>Gallus gallus</i> UCBL 454/1	4.6	5.8	3.4
<i>Gallus gallus</i> UCBL 454/3	4.3	5.6	3.4
<i>Gallus gallus</i> UCBL 454/4	3.9	5.1	3.3

Table 5. Measurements of cmc. dist. of fossil and recent Phasianidae (Ref. to Figure A1d; d—thickness in the middle of os metacarpale majus).

Species	a	b	c	d
Fossil—Dieu				
<i>Chrysolophus</i> cf. <i>amherstiae</i> NMNHS 12475	-	ca.3.6	5.0	3.2
<i>Lophura diardi</i> NMNHS 12473 (419)	7.0	3.7	6.0	3.9
<i>Polyplectron</i> cf. <i>germaini</i> NMNHS 12476	6.7	3.4	5.8	3.5
Recent				
<i>Arborophila brunneopectus</i> NMNHW 491868	5.4	3.9	4.0	2.9
<i>Crossoptilon auritum</i> UCBL (no number)	8.1	4.6	8.0	4.4
<i>Lophura nycthemera</i> UCBL (no number)	7.3	3.9	6.1	4.3
<i>Lophura diardi</i> NHMT 1976.32.3	6.8	3.7	6.0	4.6
<i>Lophura diardi</i> UCBL (no number)	7.5	4.3	6.1	4.9
<i>Syrmaticus reevesii</i> UCBL (no number)	5.4	3.0	4.8	3.5
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.9	3.0	4.6	3.3
<i>Polyplectron bicalcaratum</i> UCBL (no number)	5.8	3.1	4.8	3.1
<i>Polyplectron halcurum</i> 1848.10.31.9	5.3	3.2	4.5	2.5
<i>Polyplectron napoleonis</i> NHMT 1993.3.2	5.4	3.0	5.2	2.9
<i>Polyplectron napoleonis</i> NHMT 1993.3.1	6.1	3.1	5.4	2.9
<i>Polyplectron malacense</i> NHMT 1997.49.1	5.7	3.2	4.8	2.3
<i>Lophophorus impejanus</i> NHMT 1977.19.1	8.5	4.6	8.3	4.8
<i>Chrysolophus amherstiae</i> NHMT 1980.2.1	6.4	3.8	5.6	4.3
<i>Chrysolophus amherstiae</i> NHMT 1979.45.1	6.1	3.4	6.2	3.5
<i>Chrysolophus pictus</i> NHMT 1850.11.13.16	ca. 5.2	3.0	4.0	3.9
<i>Chrysolophus pictus</i> NHMT 1851.11.10.40	5.7	3.0	5.3	3.1
<i>Chrysolophus pictus</i> NHMT 1966.29.4	5.2	3.2	4.9	3.1
<i>Chrysolophus pictus</i> NHMT 1869.10.19.35	5.5	3.1	4.5	3.3
<i>Chrysolophus pictus</i> UCBL 131/5	7.1	3.8	6.6	4.4
<i>Itaginis cruentus</i> NHMT 1952.2.101	7.8	ca. 4.3	6.2	4.3
<i>Gallus gallus</i> NHMT 1999.43.3	7.0	4.4	6.2	4.4
<i>Gallus gallus</i> UCBL 454/3	6.9	3.9	6.0	3.9
<i>Pucrasia macrolopha</i> NHMT 1865.12.8.19	5.9	3.5	5.5	4.3

Tmt. dist. sin., NMNHS 12415 (Figure A10e) *Lophura* cf. *diardi* Dieu. TL: 20.0. *Chrysolophus pictus* and *Polyplectron bicalcaratum*: metrically; more flattened (open) distal epiphysis. *Gallus gallus*: by more flattened (open) distal epiphysis. *Syrmaticus soemmeringii*: more flattened (open) distal epiphysis. *Syrmaticus reevesii*: dimensionally; smaller foramen vasculare distale. *Crossoptilon auritum*: narrower tr. mt. II. *Lophura nycthemera*: more flattened (open) distal epiphysis. *Lophophorus impejanus*: smaller diameter of narrower tr. mt. II. *Lophura imperialis*: less robust distal epiphysis; bigger asymmetry of the tr. mt. II. *Lophura erythrophthalmus* and *Syrmaticus ellioti*: larger and more flattened distal part of the epiphysiss. *Lophura ignita rufa*: concave profile of tr. mt. II in dorsal view. *Rheinardia ocellata*: wider intertr. space between tr. mt. II and tr. mt. IV. Identical with *Lophura diardi* (Table 4). Tbt. dist. dex., NMNHS 12414 (Figure A10f) *Lophura* cf. *diardi*. Dieu. TL: 20.6. *Phasianus colchicus*: relatively thicker diaphysis at p. stn. *Chrysolophus pictus*: more concave profile in ventral view of condylus lateralis.

Rheinardia ocellata: arc-like, not trapezium-like shape of the caudal profile of the incisura intercondylaris. *Polyplectron bicalcaratum*: relatively smaller difference between dimensions of both condyles. *Tragopan satyra*: wider and more concave p. stn. *Tragopan temminckii*: deeper incisura intercondylaris. *Syrmaticus reevesii*: metrically; shallower canal under p. stn. *Syrmaticus mikado*: relatively thicker condylus med. *Crossoptilon auritum*: wider distal opening under p. stn. and shorter p. stn. *Argusianus argus* and *Gallus gallus*: more concave profile in ventral view of condylus lateralis. *Lophophorus impejanus*: almost complete absence of epicondylus med. and the smaller distal opening under p. stn. *Lophura swinhoi*: narrower opening under p. stn. *Lophura ignita rufa*: shorter p. stn. and more angular condylus med. in the ventral view. Strongly resembles *Lophura diardi* (Table 3). Tbt. dist. dex., NMNHS 12485 (Figure A10i,j) *Lophura* cf. *diardi*. Dieu. TL: 11.0. *Syrmaticus reevesii*: round condylus med. *Chrysolophus pictus*: shorter epicondylus med. and wider intercondylar distance. *Polyplectron bicalcaratum*: rounder inner edge of condylus med. in profile. *Crhysolophus auritum*: more symmetrical tr. cartilaginis tibialis. *Lophophorus impejanus*: smaller epicondylus med. and the small narrow distal opening under the supratendineus. *Gallus gallus*: rounder condylus med. *Syrmaticus ellioti*: wider p. stn.; deeper distal opening under it; rounder condylus med. *Tragopan caboti*: rounder condylus med. and the more symmetrical tr. *Lophura nycthemera*: round condylus med.; stronger lateral inclination of p. stn. *Lophura leucomelanos*: shorter p. stn.; rounder condylus lateralis. *Lophura swinhoi*: narrower incisura intercondylaris; shorter p. stn. *Lophura erythrophthalmus*: rounder condyles. *Lophura diardi*: longer p. stn.—5.9 against 5.3. (Maybe a subspecific difference). In *Lophura nycthemera*, it is even 3.9. (Table 3).

Lophura aff. *diardi* Siamese Fireback

This is endemic and uncommon to the locally common resident NW (eastern), NE, SE Thailand, and Indochina (except W, E Tonkin [7]).

Cmc. sin. prox., NMNHS 12365 (Figure A10l,m) *Lophura* aff. *diardi*. Dieu. TL: 18.5. *Rollulus rouloul*: bigger; more protruded tr. *Alectoris graeca*: os metacarpale minus in the synostosis metacarpalis prox. thicker then flattened. *Arborophila torqueola* and *Arborophila javanica*: much bigger. Dimensionally and morphologically refers to pheasants (Phasianinae). *Syrmaticus reevesii*: lower dorsal edge of condylus dorsalis. *Polyplectron germaini*: more caudal position of pr. intermetacarpalis; thicker os metacarpale majus. *Polyplectron bicalcaratum*: thicker os metacarpale majus. *Chrysolophus pictus*: rounder proximal part of metacarpal 3. *Rheinardia ocellata*: much smaller; os metacarpalis minus not flattened in prox. end. *Chrysolophus amherstiae*: more gradual transition between condylus dorsalis and os metacarpalis minus. *Gallus gallus*: more elongated profile of the tr. in caudal view; more cranial inception of os metacarpalis minus. *Syrmaticus ellioti* and *Tragopan caboti*: more concave f. a. ulnocarpalis; rounder connection of condylus ventralis with os metacarpalis minus. *Lerwa lerwa*: thicker proximal part of os metacarpalis minus. Because of its bad preservation, the finding could not be determined further. *Lophura nycthemera*: lesser caudal curve of the external condylus of tr. metacarpalis. *Lophura diardi*: very similar, but slightly narrower tr. (Table 6; Figure A1e).

Table 6. Measurements of cmc. prox. of fossil and recent Phasianidae (Ref. to Figure A1e).

Species	a	b	c
Fossil—Dieu			
<i>Arborophila brunneopectus</i> NMNHS 12463	5.8	7.2	4.8
Perdicinae gen. NMNHS 12427	5.4	6.2	3.8
<i>Lophura</i> aff. <i>diardi</i> NMNHS 12365	ca.5.5	-	ca.4.8
Phasianidae gen. NMNHS 12364	7.8	8.1	5.4
Recent			

Table 6. Cont.

Species	a	b	c
<i>Arborophila brunneopectus</i> NMNHS 12474 (417; 391)	4.3	6.6	4.5
<i>Arborophila javanica</i> NMNHS 1850.8.15.69 (417; 391)	4.1	5.8	3.7
<i>Arborophila torqueola</i> NHMT 18962.16.53	3.8	5.5	3.3
<i>Arborophila brunneopectus</i> NMNHW 491868	5.2	6.2	3.9
<i>Chrysolophus amherstiae</i> NMNHS 12477 (417; 391)	5.1	7.0	4.9
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	8.0	13.4	6.5
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	6.3	8.0	4.6
<i>Francolinus francolinus</i> NHMT 1972.1.157	4.6	6.7	4.0
<i>Francolinus pictus</i> NHMT 1921.4.21.14	4.0	5.3	3.2
<i>Francolinus levaillantii</i> NHMT 1864.7.18.7	4.8	6.8	5.2
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	3.9	4.4	2.9
<i>Alectoris graeca</i> NHMT 1868.9.12.13	5.8	7.7	4.6
<i>Alectoris graeca</i> NHMT 1909.11.18.67	5.0	6.3	4.0
<i>Coturnix coturnix</i> NHMT 1979.31.5	2.8	4.2	2.6
<i>Synoicus chinensis</i> NHMT 1992.29.4	3.0	3.2	2.1
<i>Perdica asiatica</i> NHMT 1868.9.12.8	3.1	3.8	2.4
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.6	6.4	4.3
<i>Polyplectron bicalcaratum</i> UCBL (no number)	5.7	6.6	4.7
<i>Lophura erythrophthalmus</i> NHMT 1952.2.103	7.1	9.0	5.8
<i>Lophura nycthemera</i> NHMT 1984.75.1	7.5	9.7	5.8
<i>Lophura swinhoi</i> NHMT 1966.52.36	7.7	9.1	5.6
<i>Lophura diardi</i> NHMT 1976.32.3	6.5	9.2	5.4
<i>Chrysolophus amherstiae</i> NHMT 1979.45.1	5.1	8.2	5.1
<i>Chrysolophus amherstiae</i> NHMT 1980.2.1	5.4	8.3	5.0
<i>Chrysolophus pictus</i> NHMT 1851.11.10.40	4.9	7.2	4.6
<i>Chrysolophus pictus</i> UCBL 131/5	5.9	7.0	4.8
<i>Chrysolophus pictus</i> UCBL (no number)	5.6	6.1	4.4
<i>Gallus gallus</i> UCBL 454/1	7.6	8.0	5.6
<i>Gallus gallus</i> UCBL 454/3	6.7	7.4	5.2
<i>Gallus gallus</i> UCBL 454/4	6.2	7.2	4.4
<i>Perdix perdix</i> NHMT 1930.3.24.28	4.6	5.6	3.7
<i>Bambusicola thoracica</i> NHMT 1841.10.20.1.	3.6	5.5	3.3
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	6.6	8.2	5.7
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	4.3	5.5	3.6
<i>Rollulus rouloul</i> NMNHW 490663	4.4	5.2	3.4
<i>Melanoperdix nigra</i> NMNHW 321114	5.2	5.7	3.6
<i>Syrnaticus ellioti</i> MNHNP 1909/91	7.6	8.6	5.1
<i>Tragopan caboti</i> MNHNP 1907/212	7.6	9.1	ca.7.4

Lophura nycthemera (Linnaeus, 1758)

Silver Pheasant. This is a resident of Southern China. It is an uncommon to locally common resident in N (south-east), E Myanmar, S Myanmar east of Irrawaddy R, northern Tanasserim, W, NW, NE, SE Thailand, and Indochina (except Cochinchina) [7] (Supplementary Materials, Map 2). IUCN—LC. Coracoid sternal dex., NMNHS 12360 (Figure A10u) (345) *Lophura nycthemera*. Dieu. TL: 19.5. *Tragopan satyra*: more bended f. a. sternalis; more slender diaphysis. *Syrnaticus ellioti*: more robust diaphysis; lesser prominent angulus med. *Gallus gallus*: without protruded angulus med.; considerably wider cranial part of f. a. sternalis than its caudal part. *Polyplectron bicalcaratum*: larger and lesser prominent angulus med. *Rheinardia ocellata*: shallower impressio musculi sternocoracoidei. *Lophura edwardsi*: twice-narrower f. a. sternalis; less protruded angulus med. *Lophura diardi*: less angular shape of f. a. sternalis. *Lophura ignita rufa*: smaller and narrower cranial part of f. a. sternalis. *Lophura erythrophthalmus*: more robust diaphysis and less protruded angulus med. *Lophura leucomelanos*: more robust diaphysis and lesser prominent angulus med. *Lophura edwardsi*: *Lophura nycthemera*: full identity (Table 7; Figure A1f).

Table 7. Measurements of coracoid (scapular part) of fossil and recent Phasianidae (Ref. to Figure A1f; b—length of f. a. sternalis).

Species	a	b	c
Fossil—Dieu			
cf. <i>Gallus gallus</i> NMNHS 12316	4.1	12.3	4.6
<i>Lophura nycthemera</i> NMNHS 12360	4.1	12.5	4.6
Recent			
<i>Crossoptilon auritum</i> UCBL (no number)	5.6	11.2	5.7
<i>Lophura nycthemera</i> NHMT 1851.12.3.11	5.2	6.3	4.4
<i>Lophura leucomelanos</i> NHMT 1865.10.9.19	4.7	13.1	4.8
<i>Lophura edwardsi</i> NHMT 1997.47.1	3.5	10.7	6.1
<i>Lophura nycthemera</i> UCBL (no number)	3.2	13.0	4.1
<i>Lophura diardi</i> UCBL (no number)	5.5	13.7	4.6
<i>Polyplectron bicalcaratum</i> UCBL (no number)	3.6	8.9	2.6
<i>Syrnaticus reevesii</i> UCBL (no number)	-	9.8	3.0
<i>Syrnaticus ellioti</i> MNHNP 1901/91	6.5	14.7	4.3
<i>Tragopan satyra</i> MNHNP 1884/330	6.2	13.5	4.2
<i>Tragopan caboti</i> MNHNP 1907/212	7.2	12.5	4.4
<i>Lophophorus impejanus</i> UCBL (no number)	-	15.0	5.0
<i>Chrysolophus pictus</i> UCBL (no number)	3.5	8.6	2.7
<i>Chrysolophus pictus</i> UCBL 131/5	ca.3.8	ca.10.0	3.2
<i>Phasianus colchicus</i> NHMT 1998.28.1	5.4	11.4	4.1
<i>Gallus gallus</i> UCBL 454/1	-	10.9	4.0
<i>Gallus gallus</i> UCBL 454/3	-	10.2	3.3
<i>Gallus gallus</i> UCBL 454/4	-	7.5	3.2
<i>Gallus gallus</i> NHMT 1989.19.1	4.5	11.1	3.5

Tmt. dist. sin., NMNHS 12332 (Figure A10n) *Lophura nycthemera*. Dieu. TL: 28.2. *Chrysolophus pictus*: rounder and wider shape of distal end of foramen vasculare distale on the cranial surface. *Rheinardia ocellata*: narrower epiphysis. *Polyplectron bicalcaratum*: larger diameter of condylus med. of tr. mt. II. *Phasianus colchicus*: more cranially protruded tr. mt. II. *Tragopan memminckii*: more slender distal part of diaphysis and distal epiphysis. *Lophophorus impejanus*: smaller foramen vasculare distale; more distal position. *Syrnaticus reevesii*: the smaller the foramen vasculare distale, the more flattened (open) distal epiphysis. *Lophura ignita rufa*: smaller size; more parallel axes of tr. mt. II and II. *Lophura leucomelanos*: concave, not prominent, lateral surface of tr. mt. II. All preserved details show appurtenance of the find to *Lophura nycthemera* (Table 4). Femur dist. sin., NMNHS 12327 (Figure A10o,p) *Lophura* cf. *nycthemera*. Dieu. TL: 26.8. *Crossoptilon auritum*: dimensionally; rounded caudal profile of condylus med. in ventral view. *Phasianus colchicus*: better developed crista tibiofibularis. *Polyplectron bicalcaratum*: presence of a clear dorsal edge of fossa poplitea. *Gallus gallus*: more medially situated linea intermuscularis. *Syrnaticus ellioti*: larger size; the more protruded condylus med. In a cranial direction. *Tragopan satyra*: rounder, larger and less protruded caudally condylus med. *Tragopan caboti*: larger size; wider sulcus patellaris. *Lophura leucomelanos*: longer condylus lateralis. *Lophura ignita rufa*: relatively shallower sulcus intercondylaris. *Lophura erythrophthalmus*: considerably deeper sulcus intercondylaris. *Lophura diardi*: longer condylus lateralis; narrower tr. fibularis. *Lophura swinhoi*: deeper sulcus intercondylaris; higher crista tibiofibularis. Close to *Lophura nycthemera* (Table 8; Figure A1g).

Table 8. Measurements of femur dex. dist. of fossil and recent Phasianidae (Ref. to Figure A1g).

Species	a	b	c	d
Fossil—Dieu				
<i>Gallus gallus</i> NMNHS 12349	17.8	14.5	12.5	7.9
<i>Lophura cf. nycthemera</i> NMNHS 12327	16.3	11.9	10.6	8.0
Recent				
<i>Lophura edwardsi</i> NHMT 11997.47.1	13.6	12.0	9.7	6.0
<i>Lophura nycthemera</i> NHMT 1984.75.1	15.6	12.6	10.6	6.7
<i>Lophura nycthemera</i> UCBL (no number)	15.1	12.0	11.2	7.3
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	18.8	15.7	13.4	7.9
<i>Lophura diardi</i> NHMT 1976.32.3	13.9	11.9	10.0	6.6
<i>Lophura diardi</i> UCBL (no number)	16.4	13.0	12.3	7.7
<i>Lophura leucomelanos</i> NHMT 1865.10.9.19	13.9	11.4	10.0	6.8
<i>Lophura swinhoi</i> NHMT 1966.52.36	15.6	12.9	11.0	7.3
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	14.8	11.4	10.0	6.6
<i>Argusianus argus grayi</i> NHMT 1900.7.6.23	15.7	14.3	13.0	8.2
<i>Polyplectron bicalcaratum</i> UCBL (no number)	10.8	9.0	8.4	5.3
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	15.5	14.3	12.5	7.1
<i>Lophophorus impejanus</i> UCBL (no number)	17.9	14.3	12.7	9.0
<i>Syrnaticus reevesii</i> UCBL (no number)	11.4	9.0	8.4	5.8
<i>Syrnaticus ellioti</i> MNHNP 1909/91	12.2	10.2	9.2	5.8
<i>Crossoptilon auritum</i> UCBL (no number)	18.1	16.2	13.0	9.8
<i>Tragopan satyra</i> MNHNP 1884/330	13.4	11.1	10.6	5.5
<i>Tragopan caboti</i> MNHNP 1907/212	14.1	10.4	10.9	6.3
<i>Chrysolophus pictus</i> UCBL (no number)	11.4	9.4	8.6	5.9
<i>Chrysolophus pictus</i> UCBL 131/5	12.6	10.9	9.3	6.3
<i>Gallus gallus gallus</i> NHMT 1999.43.34	15.7	13.4	11.3	7.8
<i>Gallus gallus bankiva</i> NHMT 1864.11.27.13	14.4	11.7	9.9	6.0
<i>Gallus gallus bankiva</i> NHMT 1868.2.19.59	13.6	11.7	9.8	6.5
<i>Gallus gallus jabouillei</i> NHMT 1989.19.1	13.9	12.0	10.1	5.9
<i>Gallus gallus domestica</i> [Leghorn] NHMT 1999.43.56	13.5	16.4	13.7	8.0
<i>Gallus gallus</i> UCBL 454/1	13.7	10.5	9.4	6.4
<i>Gallus gallus</i> UCBL 454/3	12.9	10.6	9.2	5.5
<i>Gallus gallus</i> UCBL 454/4	11.4	9.2	7.9	5.7
<i>Phasianus colchicus</i> NHMT 1999.43.207	15.4	13.3	11.2	7.8

Tbt. dist. dex., NMNHS 12348 (Figure A10s,t) *Lophura cf. nycthemera* Dieu. TL: 20.0. *Crossoptilon*: smaller tuberculum retinaculi musculus fibularis. *Chrysolophus pictus*: wider diaphysis. *Rheinardia*: rigther distal epiphysis; deeper tendineal incisura on lateral side. *Lophura diardi*: smaller; deeper tendineal groove on the distal lateral side of diaphysis. *Lophura leucomelanos*: more asymmetrical distal epiphysis in the caudal view. *Lophura ignita rufa*: more slender distal diaphysis. *Lophura erythrophthalmus*: considerably more concave diaphysis. on its medial side. Preserved details could refer this specimen to *Lophura nycthemera* (Table 3). Tbt. dist. dex., NMNHS 12358 (Figure A10q,r) *Lophura cf. nycthemera*, Dieu. TL: 21.6. *Polyplectron germaini*: a considerably larger size; absence of a toothlet on the lateral side at the level of the proximal opening under p. stn. *Phasianus colchicus*: shorter p. stn. *Chrysolophus pictus*: more robust epiphysis. *Crossoptilon auritum*: shorter p. stn. *Lophophorus impejanus*: much smaller size; relatively thinner distal part of diaphysis. *Tragopan satyra*: smaller dimensions; more medial position of the condylus med. *Rheinardia ocellata*: less concave lateral sides of both condyles. *Gallus gallus*: bigger symmetry of distal epiphysis. *Lophura swinhoi*: rounder and not elliptical shape of condylus med. *Lophura diardi* and *Lophura erythrophthalmus*: (absence of) smaller tuberculum on the medial side above the p. stn. *Lophura ignita rufa*: smaller size; the rounded, not sharpened proximal edge of p. stn. High similarity with *Lophura nycthemera* (Table 3). Tmt dex., male, NMNHS 12350 (Figure A10v) *Lophura cf. nycthemera*. Dieu. TL: 34.9. *Polyplectron bicalcaratum*: more massive diaphysis. *Lophophorus impejanus* and

Tragopan satyra: shorter crest; less concave cranial surface. *Syrmaticus ellioti*: similar, but the preserved fragment is insufficient for generic determination. *Tragopan temminckii*: more robust. *Lophura ignita*: very similar, but in the preserved fragment crista mediano-plantaris are flattened instead of concave. *Lophura nycthemera*: complete similarity (Table 9).

Table 9. Measurements of tmt. of fossil and recent Phasianidae (a—width of diaphysis.; b—height of crista mediano-plantaris; c—length of the spur/by chorde; approximately /).

Species	a	b	c
Fossil—Dieu			
<i>Lophura cf. nycthemera</i> NMNHS 12350	6.6	4.1	ca.15.0
Recent			
<i>Lophura nycthemera</i> UCBL	ca.5.8	2.2	-
<i>Lophura nycthemera whiteheadi</i> NHMT 1966. 52.35	5.8	3.0	9.0
<i>Lophura ignita</i> NHMT 1911.10.13.1	6.8	4.5	22.7
<i>Lophura diardi</i> UCBL	ca.6.0	3.2	15.8
<i>Tragopan satyra</i> NMNHS 2000.14.7	6.8	4.5	ca.11.8
<i>Tragopan temminckii</i> NHMT 1976.1.1	4.9	3.6	-
<i>Tragopan temminckii</i> NHMT 1998.12.3	4.8	-	-
<i>Syrmaticus ellioti</i> NMNHT 1994.63.2	5.5	3.4	ca. 21.5
<i>Syrmaticus reevesii</i> UCBL	4.2	2.7	-
<i>Polyplectron bicalcaratum</i> UCBL	3.4	1.7	-
<i>Chrysolophus pictus</i> UCBL	4.0	1.2	-
<i>Chrysolophus pictus</i> UCBL 131/5	4.2	-	-
<i>Crossoptilon auritum</i> UCBL	5.6	2.0	-
<i>Gallus gallus</i> UCBL 454/1	4.6	-	-
<i>Gallus gallus</i> UCBL 454/3	5.7	0.5	ca.15.3
<i>Gallus gallus</i> UCBL 454/7	5.5	-	-
<i>Lophophorus impejanus</i> UCBL	6.3	1.9	-

Lophura edwardsi (Oustalet, 1896) Edward's Pheasant

This is endemic and a rare local resident in C Annam [7] (Supplementary Materials, Map 3). IUCN—CR.

Coracoid dext. omal part, NMNHS 12397 (Figure A10w). *Lophura edwardsi*, Dieu. TL: 20.4. *Chrysolophus pictus*: more massive; prominent dorsally acrocoracoidal part. *Polyplectron bicalcaratum*: sharper and ventrally directed tip of the acrocoracoidal part. *Polyplectron germaini*: larger size; wider impressio ligamenti acrocoracohumeralis. *Gallus gallus*: shorter acrocoracoidal part. *Syrmaticus reevesii*: downward directed processus acrocoracoideus and facies furcularis. *Lophophorus impejanus*: almost twice as small (shorter) acrocoracoidal part. *Argusianus argus*, *Rheinardia ocellata*, *Lophura ignita rufa*, and *Crossoptilon auritum*: much smaller size. *Crossoptilon auritum*: higher tip of the acrocoracoidal part (i.e., processus acrocoracoideus and facies furcularis sulcus clavicularis [21]. Similar to *Lophura*. *Lophura nycthemera*: the same way. *Lophura leucomelanos*: blunter f. a. clavicularis. *Lophura diardi*: dimensionally, considerably shorter f. a. clavicularis and its stronger medial curve. Morphologically identical to *Lophura edwardsi* (Table 2).

Lophura nycthemera (aff. “*imperialis*” Delacour and Jabouille, 1924)/*Lophura edwardsi* (Oustalet, 1896) var. *hatinhensis*

Lophura imperialis: Endemic. It is a rare resident of N and C (north) Annam. It is only known from three specimens [7]. *Lophura hatinhensis*: Endemic. It is a scarce local

resident of N and C (north) Annam [7]. [17,25] state that the status of *Lophura imperialis* and *Lophura edwardsi hatinhensis* requires revision. Coracoid omal dex., NMNHS 12356 (Figure A10x) *Lophura* aff. *imperialis*/*Lophura edwardsi hatinhensis*, Dieu. TL: 18.6. Besides the incompleteness of the distal (humeral) epiphysis, the finding is certainly referred to Phasianidae. *Syrmaticus reevesii*: metrically and ventrally directed tip of the acrocoracoidal part. *Chrysolophus pictus* and *Polyplectron bicalcaratum*: metrically; more shortened distal part of and the whole pr. acrocoracoideus. *Crossoptilon auritum*: metrically; longer radius of the arc of concavity of f. a. humeralis; much shorter acrocoracoidal part. *Gallus gallus*: bigger curve of the sulcus musculi supracoracoidei. *Syrmaticus ellioti*: sharper angle of processus acrocoracoideus, wider f. a. humeralis. *Tragopan satyra*: thicker (more robust) distal epiphysis; rounded acrocoracoid. *Tragopan caboti*: rounder and wider f. a. humeralis; dorso-ventrally flattened f. a. clavicularis. *Rheinardia ocellata*: much shorter acrocoracoidal part. In morphology, the finding tends to *Lophura*. *Lophura leucomelanos*: thinner f. a. clavicularis. *Lophura diardi*: thinner pr. acrocoracoideus. *Lophura nycthemera*: dimensionally; thinner part of extremitas omalis coracoidei. *Lophura swinhoii*: more open sulcus musculi supracoracoidei. *Lophura erythrophthalmus*: lower, not protruded f. a. clavicularis. Two uncomparing species of this genus occur at present in Vietnam—*Lophura imperialis* (Imperial Pheasant) and *Lophura edwardsi hatinhensis* (Vietnamese pheasant). Unfortunately, we did not have access to comparative material to complete identification (Table 2).

Lophura Fleming, 1822 sp.

Tmt. dist. dex. NMNHS 12429 Dieu. *Lophura* sp. The epiphysis is missing. TL: 10.9. Fossa metatarsi I on the caudal surface is preserved. *Crossoptilon*: more flattened shape of this part of the bone. *Polyplectron bicalcaratum* and *Lophophorus impejanus*: more developed longitudinal grooveness on the cranial surface. *Gallus gallus*: more relief cranial surface of diaphysis. *i*: sharper edges of fossa metatarsi I. The finding shows that the tmt. is slender and flattened in the area of fossa metatarsi I—a diagnostic feature, excluding *Phasianus*, *Tragopan*, *Syrmaticus*, *Rheinardia*, *Pavo*, and *Crossoptilon*. *Lophura ignita rufa*: clearer relief on the cranial surface of the bone and the smaller size. Similarity with smaller species of g. *Lophura* and especially *Lophura diardi* and *Lophura erythrophthalmus*. The bad preservation of the finding does not allow further identification (Table 10; Figure A1h).

Tmt. dist. dex. NMNHS 12334. (Figure A10y) *Lophura* sp. Dieu. TL: 25.4. Only tr. mt. II is preserved from the tr.s. The finding could be referred to a subadult male individual of large phasianids (except *Pavo*). *Pavo muticus*: much smaller and more elongated foramen vasculare distale. *Crossoptilon auritum*: much larger distal width. *Syrmaticus reevesii*: dimensionally; less-relief tr. mt. II on its plantar (caudal) side. *Argusianus argus grayi* and *Rheinardia ocellata*: wider diaphysis in its distal part. *Polyplectron bicalcaratum*: much smaller foramen vasculare distale (in *Polyplectron bicalcaratum* it is 1.7 mm long). *Lophophorus impejanus*: more asymmetrical tr. mt. II. *Chrysolophus pictus*: presence of a longitudinal groove between tr. mt. 3 and tr. mt. 4. *Gallus gallus*: deeper cutting groove between tr. mt. 2 and tr. mt. II. *Syrmticus ellioti*: more flattened distal epiphysis, wider tr. mt. II and non-parallel; bifurcated, medial and lateral surfaces of tr. mt. II. *Phasianus colchicus*: larger; of wider diaphysis. *Gallus gallus*: larger than males and of wider diaphysis. *Tragopan caboti*: larger size; more flattened, wider distal epiphysis; more symmetrical tr. mt. II. *Tragopan temminckii*: wider epiphysis. *Tragopan satyra*: resembles, but has narrower tr. mt. musculus II. *Lophura diardi*: the bigger the foramen vasculare distale, the more flattened diaphysis in the distal part. *L. swinhoii*: smaller foramen vasculare distale. *Lophura nycthemera*: similar, but a little bit larger in size. Preserved features fit the find to g. *Lophura* (Table 4).

Table 10. Measurements of tmt. dist. of fossil and recent Phasianidae (Ref. to Figure A1h; a—width of diaphysis in the upper end of fossa metatarsi I; b—thickness in the same place).

Species	a	b
Fossil—Dieu		
<i>Lophura</i> sp. NMNHS 12429	6.3	3.3
Recent		
<i>Crossoptilon auritum</i> NHMT 1868.9.12.25	8.4	4.8
<i>Crossoptilon auritum</i> UCBL (no number)	6.4	4.0
<i>Lophura nycthemera</i> UCBL (no number)	6.9	3.1
<i>Lophura diardi</i> UCBL (no number)	6.2	4.0
<i>Lophura diardi</i> NHMT 1976.32.3	6.2	3.6
<i>Lophura swinhoii</i> NHMT 1966.55.36	7.3	4.5
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	8.7	ca. 4.5
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	5.8	3.4
<i>Syrnaticus ellioti</i> NHMT 1994.63.2	7.0	4.0
<i>Syrnaticus reevesii</i> UCBL (no number)	5.1	2.3
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.6	2.3
<i>Lophophorus impejanus</i> UCBL (no number)	7.3	5.0
<i>Chrysolophus pictus</i> UCBL (no number)	4.7	2.7
<i>Chrysolophus pictus</i> UCBL 131/5	5.4	3.0
<i>Phasianus colchicus</i> NHMT 1999.43.207	7.0	4.2
<i>Rheinardia ocellata</i> NHMT 1920.9.8.1169	7.1	3.3
<i>Gallus gallus</i> UCBL 454/1	6.3	3.4
<i>Gallus gallus</i> UCBL 454/3	5.6	3.5
<i>Gallus gallus</i> UCBL 454/4	5.3	2.7

Chrysolophus amherstiae Leadbeater, 1829 Lady Amherst's Pheasant

This is an uncommon local resident in N (east) and E (north-east) Myanmar [7] (Supplementary Materials, Map 4). IUCN—LC. Cmc. prox. sin. NMNHS 12477 (Figure A11a,b) *Chrysolophus amherstiae* Dieu. TL: 23.8. The find preserves only the proximal epiphysis and the inception of os metacarpale majus and os metacarpale minus. Dimensions refer it to Phasianinae. *Rhizothera longirostris*: similar in size and general morphology; the inception of os metacarpale minus is much more protruded ventrally. *Alectoris graeca* and *Francolinus pictus*: larger; the inception of os metacarpale minus is much more protruded ventrally. *Rollulus roulroul*: much larger. *Perdix perdix*: larger; bigger pr. pisisformis. *Pucrasia asiatica* and *Synoicus ypsilophorus*: much larger. *Lerwa lerwa*: the inception of os metacarpale minus is much more protruded ventrally. *Arborophila torqueola*: much larger. *Arborophila javanica*: much larger. *Polyplectron bicalcaratum*: much larger. *Bambusicola thoracica*: much larger: very similar, but larger in size. *Gallus gallus*: shorter pr. alularis; slightly more angular than the rounded dorsal condylus dorsalis of tr. carpalis; thinner pr. extensorius in a cranial view. *Rheinardia ocellata*: smaller; straight, not slightly bent os metacarpale majus. *Argusianus argus*: smaller; not concave tr. metacarpalis. *Phasianus colchicus*: better developed pr. pisisformis; the inception of os metacarpale minus is much more protruded ventrally. *Tragopan satyra* and *Tragopan temminckii*: smaller; thinner pr. extensorius. *Syrnaticus ellioti*: bigger pr. pisisformis; shorter synostosis metacarpalis prox. *Chrysolophus pictus*: larger; bigger and rounder pr. pisisformes. *Crossoptilon auritum*: smaller; shorter synostosis metacarpalis prox. *Lophura ignita rufa*: smaller; thinner pr. extensorius. *Syrnaticus rivesii*: smaller; more ball-like shape of pr. pisisformis. *Lophura nycthemera*: smaller; shorter synostosis metacarpalis prox. *Lophura diardi*: shorter synostosis metacarpalis prox. *Lophura erythrophthalmus*: smaller; thinner pr. pisisformis. *Chrysolophus amherstiae*: very close (Table 6).

Chrysolophus cf. *amherstiae* Lady Amherst's Pheasant

This is an uncommon local resident in N (east) and E (north-east) Myanmar [7]. Cmc. dist. sin. NMNHS 12475 (Figure A11c) *Chrysolophus* cf. *amherstiae*. TL: 18.9. The distal joint

has been partly broken, but f. a. digitalis minoris is preserved. *Polyplectron bicalcaratum*: shallower and flattened f. a. ossis metacarpale minus 1. *Lophura diardi*: dimensionally and shallower relief of f. a. digit. minus. *Lophura nycthemera* and *Syrmaticus reevesii*: shallower distal longitudinal groove on os metacarpale minus. *Crossoptilon auritum*: shorter synostosis metacarpalis dist., as well as metrically. *Lophophorus impejanus*: dimensionally and less prominent f. a. dig. 3. *Gallus gallus*: smaller f. a. digitalis minoris. Similar to *Chrysolophus*. *Chrysolophus pictus*: more caudally directed os metacarpale minus at the synostosis metacarpalis dist. Details of f. a. digitalis minus and other elements and the measurements resemble female individuals of *Chrysolophus amherstiae* (Table 5).

Gallus gallus (Linnaeus, 1758) Red Junglefowl

G. g. spidaceus; *G. gallus gallus*: (NE [eastern], SE Thailand, and S Indochina); *G. g. jabouillei* (east N Laos, W, E Tonkin, and N Annam). It is a resident of N, NE, E Indian subcontinent, SW, and S China. It is a common resident (except in C Thailand and Singapore). It is recorded in (status uncertain, perhaps introduced) Singapore [7] (Supplementary Materials, Map 5). IUCN—LC. Scapula prox. dex., NMNHS 12331 (Figure A11d) *Gallus gallus*. Dieu. TL: 21.3. *Polyplectron germaini*: larger and angular f. a. humeralis. *Lophura edwardsi*: longer and narrower f. a. clavicularis. *Lophura diardi*: smaller acromion. *Syrmaticus ellioti*: rounder f. a. humeralis. *Tragopan caboti* and *Tragopan satyra*: thicker corpus scapulae and less formed column of the scapula. *Phasianus colchicus*: narrower f. a. clavicularis. *Chrysolophus amherstiae*: narrower f. a. clavicularis. *Arborophila*, *Rollulus*, *Alectoris*, *Perdix* and *Francolinus* are of a considerably smaller size. Completely corresponds to *Gallus gallus* (Table 11; Figure A2e). Ulna sin., NMNHS 12432 *Gallus gallus* (Figure A11f,g). Dieu. Dimensionally, the specimen could be referred to the smallest representatives of Phasianinae. *Phasianus colchicus*: smaller size (much smaller even of the female pheasants); absence of a sharp transition between the condylus dorsalis and the diaphysis. *Chrysolophus pictus*: longer impressio brachialis. *Polyplectron bicalcaratum*: wider proximal epiphysis; rounder processus cotylaris dorsalis. *Perdix*: larger size; sharper olecranon. *Lerwa*: sharper proximal end of the depressio musculusbrachialis; less developed papillae remigales caudales. *Alectoris*: less flattened diaphysis in the proximal half. *Francolinus francolinus*: rounder profile of condylus dorsalis and larger size. *Lophura diardi*: sharper olecranon. *Lophura nycthemera*: metrically; more curved dorsally tip of the olecranon; more distal position of impressio brachialis. *Syrmaticus reevesii*: more elongated cotyla dorsalis. *Chrysolophus auritum*: metrically; smaller tuber carpale and the sharper and more prominent condylus ventralis ulnaris. *Lophophorus impejanus*: relatively smaller tuber carpale. Fully corresponds to *Gallus gallus*, but dimensionally it is close to the smallest forms of that species (Table 11; Figure A1i).

Table 11. Measurements of ulna of fossil and recent Phasianidae (Ref. to Figure A1i; a—width of proximal epiphysis).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Gallus gallus</i> NMNHS 12432	6.8	9.8	3.4	5.4	53.3
Recent					
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	4.6	7.4	2.5	5.3	4.0
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	8.2	10.6	3.7	5.8	6.2
<i>Phasianus colchicus</i> NHMT 1999.43.211	8.5	12.3	4.4	8.9	65.4
<i>Phasianus colchicus</i> NHMT 1999.43.207	10.2	13.4	5.1	9.0	70.2
<i>Crossoptilon auritum</i> UCBL (no number)	10.7	13.9	4.5	7.3	72.6
<i>Lophura nycthemera</i> UCBL (no number)	9.7	12.9	4.6	7.2	71.5
<i>Lophura diardi</i> UCBL (no number)	9.3	14.0	4.6	7.3	76.5

Table 11. Cont.

Species	a	b	c	d	e
<i>Syrnaticus reevesii</i> UCBL (no number)	6.9	8.8	3.1	5.0	47.1
<i>Polyplectron bicalcaratum</i> UCBL (no number)	7.2	9.6	3.3	5.3	52.5
<i>Lophophorus impejanus</i> UCBL (no number)	12.0	16.2	5.1	8.4	84.7
<i>Alectoris graeca</i> NHMT 1868.9.12.13	6.7	10.4	3.6	6.0	50.6
<i>Francolinus francolinus</i> NHMT 1972.1.157	6.1	9.1	3.2	4.9	49.3
<i>Chrysolophus pictus</i> UCBL 131/5	6.9	10.1	3.5	5.9	53.7
<i>Gallus gallus</i> NHMT 1999.43.3	8.1	12.3	4.3	8.0	62.1
<i>Gallus gallus</i> UCBL 454/1	8.1	11.6	4.0	6.4	65.0
<i>Gallus gallus</i> UCBL 454/3	7.3	11.6	3.5	6.0	60.0
<i>Gallus gallus</i> UCBL 454/4	6.3	10.5	3.5	5.2	52.7

Femur dist. dex., NMNHS 12349 *Gallus galus*. TL: 20.1. *Argusianus argus*: considerably wider sulcus intercondylaris. *Lophura nycthemera* and *Lophura swinhoii*: wider and more symmetrical sulcus intercondylaris. *Lophura edwardsi*: larger; wider and shallower sulcus intercondylaris. *Lophura ignita rufa*: wider sulcus intercondylaris. *Rheinardia ocellata*: larger; much wider sulcus intercondylaris and shorter condylus med. and condylus lateralis. *Phasianus colchicus*: larger; much better shaped impressio ansa musculus iliofibularis. Morphologically identical with larger (male) *Gallus gallus*. The compared fossil specimen completely fits to the adult males of larger breeds (Leghorn) of the domestic fowl. A Red Junglefowl of such a large size could only be a domestic form (and could not be of Paleolithic Age) (Table 8). Tbt. dist. sin., NMNHS 12393 (Figure A11h,i) *Gallus gallus*. Dieu. TL: 20.6. *Polyplectron bicalcaratum*: lower caudal edge in profile in a ventral view of the condylus med. *Lophura diardi*: metrically; lower epicondylus med. *Lophura nycthemera*: twice longer p. stn. *Syrnaticus reevesii*: parallel condyles. *Crossoptilon auritum*: more symmetrical tr. cartilaginis tibialis in caudal view. *Lophophorus impejanus*: shape of epicondylus lateralis; the smaller distal opening under p. stn. *Rheinardia*: longer p. stn. *Chrysolophus amherstiae*: longer p. stn. *Chrysolophus pictus*: almost absent epicondylus lateralis and epicondylus med. Similar both in morphology and size to *Gallus gallus* (Table 3). Tbt. dist. sin., NMNHS 12396 (Figure A11m) *Gallus gallus*, Dieu. TL: 25.0. *Crossoptilon*: rounder contour of condylus lateralis in its distal caudal part. *Syrnaticus ellioti*: arc-like, not angular, shape of the dorsal edge of p. stn. *Lophura diardi*: rounder condylus lateralis. *Lophura nycthemera*: less round profile of condylus med. *Lophophorus impejanus*: deeper tendineal canal on the lateral surface of the distal part of the diaphysis. *Syrnaticus reevesii*: rounder condylus lateralis. *Polyplectron bicalcaratum*: more flattened (concave) p. stn.; more clear tendinal canal on the lateral surface in the distal one fourth part of diaphysis. *Chrysolophus pictus*: lateral, not medial, slope of dorsal edge of p. stn. *Rheinardia*: narrower upper opening of p. stn. *Argusianus*: sharper, not gradual, transition between the diaphysis and distal epiphysis. Completely corresponds to *Gallus gallus* (Table 3). Tbt. dist. dex., NMNHS 12395 (Figure A11k,l) cf. *Gallus gallus* Dieu. TL: 20.6. The finding represents a bone splinter of the diagonally broken distal epiphysis. Condylus med. and sulcus cartilaginis tibialis are completely preserved. *Crossoptilon*: rounder condylus med. *Lophura nycthemera*: lesser developed tuberculum retinaculi musculus fibularis, but it is close to this species. *Lophura diardi*: size and the smaller epicondylus med. *Lophophorus impejanus*: much shorter epicondylus med. *Syrnaticus reevesii*: more elliptic lateral profile of the condylus lateralis. *Polyplectron bicalcaratum*: gradual transition of the diaphysis into epiphysis without an angle in medial view. *Chrysolophus pictus*: shorter epicondylus med. *Syrnaticus ellioti*: narrower intercondylar space; rounder shape of the profile of the condylus med. and the more concave in ventral view profile of the condylus lateralis. *Tragopan satyra*: smaller size; less concave medial side of condylus med. Similar to *Gallus gallus* (Table 3). Tmt (spur fragment)

dex., NMNHS 12486 (Figure A11p) *Gallus gallus*. Dieu. TL: 29.7. Having more massive diaphysis, this finding clearly distinguished the male specimens of *Chrysolophus pictus* and *Polyplectron bicalcaratum*. *Gallus gallus* has a narrower base of the spur and shallower sulcus flexorius at the spur base. It completely corresponds to *Lophura diardi* by its cranial surface: profile of the section and the thicker shape of the spur. *Syrnaticus soemmerringii*, *Tragopan temminckii*, *Tragopan satyra*, and *Lophophorus impejanus*: much developed spur. *Phasianus* and *Lophura*: shorter, thick and bent upright spur. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.1, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75. *Phasianus colchicus* and *Lophura diardi*: sharp, not right, angle between the axis of the spur and the axis of the diaphysis. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.91, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75. The measurement “c” is the width of facies cranialis, measured at the level of the spur (Table 12; Figure A2a).

Tmt (spur fragment) dex., NMNHS 12487 (Figure A11q) *Gallus gallus*. Dieu. TL: 21.2. *Lophura diardi*: thinner proximal half of spur and the longer spur as whole. *Syrnaticus soemmerringii*, *Tragopan temminckii*, *Tragopan satyra*, and *Lophophorus impejanus*: much developed spur. *Phasianus* and *Lophura*: shorter, thick, and bent upright spur. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.1, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75. *Phasianus colchicus* and *Lophura diardi*: sharp, not right, angle between the axis of the spure and the axis of the diaphysis. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.91, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75 (Table 12). Tmt (spur fragment) dex., NMNHS 12488 (Figure A11r) *Gallus gallus*. Dieu. TL: 29.8. *Lophura diardi*: thinner and almost twice as long spur; shallower relief of diaphysis. Having a more massive diaphysis, the finding clearly distinguished the male specimens of *Chrysolophus pictus* and *Polyplectron* spp. *Syrnaticus soemmerringii*, *Tragopan temminckii*, *Tragopan satyra*, and *Lophophorus impejanus*—with more developed spurs. *Phasianus* and *Lophura*: shorter, thick, and bent upright spur. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.1, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75. *Phasianus colchicus* and *Lophura diardi*: sharp and a not right angle between the axis of the spur and the axis of the diaphysis. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.91, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75 (Table 12). Tmt (spur fragment) sin., NMNHS 12489 *Gallus gallus*. Dieu. TL: 15.6. *Lophura diardi*: thinner spur. Having a more massive diaphysis, the finding clearly distinguished the male specimens of *Chrysolophus pictus* and *Polyplectron* spp. *Syrnaticus soemmerringii*, *Tragopan temminckii*, *Tragopan satyra*, and *Lophophorus impejanus* as having much more developed spurs. *Phasianus* and *Lophura*: shorter, thick, and bent upright spur. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.1, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75. *Phasianus colchicus* and *Lophura diardi*: sharp, not right, angle between the axis of the spur and the axis of the diaphysis. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.91, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75. (Table 12). Tmt (spur fragment) dex., NMNHS 12490 (Figure A11s) *Gallus gallus*. Dieu. TL: 10.7. *Lophura diardi*: thinner spur; more massive diaphysis—the finding clearly distinguished the male specimens of *Chrysolophus pictus* and *Polyplectron* spp. *Syrnaticus soemmerringii*, *Tragopan temminckii*, *Tragopan satyra*, and *Lophophorus impejanus* as having much more developed spurs. *Phasianus* and *Lophura*: shorter, thick, and bent upright spur. *Phasianus colchicus* and *Lophura diardi*: sharp, not right, angle between the axis of the spur and the axis of the diaphysis. Index: “diameter in the base: total length” of the spur of tmt varies in *Gallus gallus* between 3.30 and 2.91, while in *Phasianus* and *Lophura* it is much lower—1.29 to 1.75 (Table 12). Synsacrum, copora vertebrorum (caudal part) NMNHS 12483 (Figure A11o) *Gallus gallus*. Dieu. TL: 31.6. *Lophura nycthemera*: wider caudal part (measurements “b” and “c”; Figure A2b). *Syrnaticus reevesii*: more caudally inclined 2nd and 3rd paraphophyses. *Crossoptilon*: sharp edges and not the flattened parapophyses.

Polyplectron bicalcaratum: smaller distance between the 4th and the 5th parapophyses, not between the 3rd and 4th. *Lophophorus impejanus*: thicker and shorter processi transversi of the synsacral caudal vertebra. *Chrysolophus pictus*: larger distance between the 5th and 6th parapophyses. *Gallus gallus*: more protruded processi transversi. *L. diardi*: narrower 3rd parapophysis. *Lophura edwardsi*, *Lophura diardi* and *Lophura leucomelanos*: similar, but the last two parapophyses are slightly caudally directed. All features and proportions show *Gallus gallus* (Table 13: Figure A2b).

Table 12. Measurements of tmt. dist. of fossil and recent Phasianidae (Ref. to Figure A2a).

Species	a	b	c	b/a
Fossil—Dieu				
<i>Gallus gallus</i> NMNHS 12486	9.0	ca.22.0	5.9	2.44
<i>Gallus gallus</i> NMNHS 12487	7.5	ca.19.0	-	2.53
<i>Gallus gallus</i> NMNHS 12488	8.0	ca.27.0	5.9	3.38
<i>Gallus gallus</i> NMNHS 12489	8.3	ca.25.0	-	3.00
<i>Gallus gallus</i> NMNHS 12490	7.4	17.0		2.28
Recent				
<i>Gallus gallus</i> NHMT 1989.19.1	6.8	21.0	6.1	3.08
<i>Gallus gallus</i> NHMT 1982.43.39	6.4	13.8	7.0	2.15
<i>Gallus g. bankiva</i> UCBL 454/1	-	-	5.8	-
<i>Gallus gallus</i> UCBL 454/2	4.8	14.0		2.91
<i>Gallus gallus</i> UCBL 454/3	5.6	ca.15.6		2.78
<i>Gallus Gallus gallus</i> UCBL 456/2	6.5	ca.15.0	-	2.30
<i>Phasianus colchicus</i> UCBL 131/6	7.2	9.3	-	1.29
<i>Lophura diardi</i> UCBL (1980)	ca.8.0	ca.14.0	5.4	1.75
<i>Lophura diardi</i> NHMT 1976.32.3	-	-	4.5	-
<i>Lophura nycthemera</i> UCBL (no number)	-	-	5.8	-
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	6.0	9.8	4.4	1.63
<i>Tragopan temminckii</i> NHMT 1976.1.1	7.0	7.2	5.9	1.02
<i>Tragopan satyra</i> NHMT 2000.14.7	7.1	11.9	6.5	1.67
<i>Syrnaticus reevesii</i> UCBL (no number)	-	-	4.2	-
<i>Syrnaticus ellioti</i> NHMT 1994.63.2	9.7	ca. 19.0	5.5	ca. 1.58
<i>Syrnaticus soemmerringii</i> NHMT 1860.8.25.7	5.4	6.2	4.7	1.14
<i>Crossoptilon auritum</i> UCBL (no number)	-	-	5.4	-
<i>Argusianus argus</i> NHMT 1900.7.6.23	-	-	5.3	-
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	-	-	5.4	-
<i>Lophophorus impejanus</i> NHMT 1977.19.1	8.8	9.7	7.4	1.10
<i>Lophophorus impejanus</i> UCBL (no number)	-	-	6.5	-
<i>Chrysolophus pictus</i> UCBL (no number)	-	-	4.0	-
<i>Chrysolophus pictus</i> UCBL (no number)	-	-	3.9	-
<i>Polyplectron germaini</i> NHMT 1977.98.1	-	-	3.6	-
<i>Polyplectron napoleonis</i> NHMT 1993.3.1	4.9	5.2	4.5	-
<i>Polyplectron bicalcaratum</i> UCBL (no number)	-	-	3.5	-
<i>Polyplectron bicalcaratum</i> NHMT 1926.9.8.1173	ca. 5.0	ca. 6.8	ca. 6.6	ca. 1.36

Table 13. Measurements of synsacrum of fossil and recent Phasianidae (Ref. to Figure A2b; c—thickness of the axial part of the copora vertebrorum between the 2nd and the 3rd parapophyses; d—length to the 6th parapophyses).

Species	a	b	c	d
Fossil—Dieu				
<i>Gallus gallus</i> NMNHS 12483	ca.4.2	12.0	3.1	27.2
Recent				
<i>Crossoptilon auritum</i> UCBL (no number)	4.9	17.2	4.4	29.2
<i>Lophura edwardsi</i> NHMT 1997.47.1	4.3	13.8	3.0	28.3
<i>Lophura leucomelanos</i> NHMT 1865.10.9.19	ca. 5.5	13.8	3.4	29.0
<i>Lophura nycthemera</i> UCBL (no number)	5.8	17.3	3.5	29.8
<i>Lophura diardi</i> NHMT 1976.32.3	ca. 4.5	14.3	3.8	27.8
<i>Lophura diardi</i> UCBL (no number)	5.8	16.7	4.0	33.1
<i>Polyplectron bicalcaratum</i> UCBL (no number)	3.5	11.1	3.3	24.5
<i>Lophophorus impejanus</i> UCBL (no number)	4.9	18.7	5.1	30.5
<i>Syrnaticus reevesii</i> UCBL (no number)	ca.4.9	12.4	3.2	22.2
<i>Chrysolophus pictus</i> UCBL (no number)	4.4	13.3	2.9	22.3
<i>Chrysolophus pictus</i> UCBL 131/5	4.4	13.8	3.0	23.6
<i>Gallus gallus</i> UCBL 454/3	4.8	10.7	3.5	32.4
<i>Gallus gallus</i> UCBL 454/4	3.8	10.9	2.9	23.6
<i>Gallus gallus</i> UCBL 454/1	5.0	13.0	3.4	29.0

Tmt. prox. sin. NMNHS 12399 (Figure A11t,u) cf. *Gallus gallus*, Dieu. TL: 26.3. *Crossoptilon*: more prominent eminentia intercondylaris; the rounder shape of the cotyla med. *Lophura ignita rufa*: lesser cranial slope of the cotyla lateralis in a lateral view. *Lophura nycthemera*: smaller cranial slope of crista lateralis hypotarsi. *Syrnaticus reevesii*: metrically; thicker diaphysis (its lateral edge in the proximal end). *Polyplectron bicalcaratum*: less developed crista med. hypotarsi. *Lophura imperialis* and *Chrysolophus pictus*: rounder shape of the cotyla lateralis. *Tragopan caboti*: rounder shape of the cotyla med. and cotyla lateralis. *Argusianus*: lesser cranial cutting of cotyla lateralis in the cranial view. *Rheinardia*: more massive diaphysis. Resembles *Gallus gallus* (Table 14; Figure A2c).

Table 14. Measurements of tmt. prox. of fossil and recent Phasianidae (Ref. to Figure A2c).

Species	a	b	c	d
Fossil—Dieu				
<i>Gallus</i> cf. <i>gallus</i> NMNHS 12399	11.6	6.1	8.1	11.2
Recent				
<i>Crossoptilon auritum</i> UCBL (no number)	12.6	7.8	8.5	13.0
<i>Lophura nycthemera</i> UCBL (no number)	12.3	6.0	7.0	12.0
<i>Lophura diardi</i> UCBL (no number)	13.8	7.3	9.6	13.5
<i>Lophura ignita rufa</i> NHMT 1869.10.19.18	14.6	8.4	10.8	14.9
<i>Polyplectron bicalcaratum</i> UCBL (no number)	9.4	4.6	4.9	8.8
<i>Syrnaticus reevesii</i> UCBL (no number)	9.3	5.5	6.5	9.0
<i>Argusianus argus grayi</i> NHMT 1900.7.6.23	12.4	8.0	9.3	13.0

Table 14. Cont.

Species	a	b	c	
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	12.9	7.8	8.5	11.2
<i>Lophophorus impejanus</i> UCBL (no number)	14.0	7.8	11.2	13.4
<i>Chrysolophus pictus</i> UCBL (no number)	8.9	ca.5.2	6.0	9.3
<i>Chrysolophus pictus</i> UCBL 131/5	10.0	5.2	6.9	10.0
<i>Gallus gallus</i> UCBL 454/1	12.0	5.6	8.3	10.3
<i>Gallus gallus</i> UCBL 454/3	12.1	6.0	8.5	10.5
<i>Gallus gallus</i> UCBL 454/4	10.7	5.2	7.4	9.0

Scapula prox. dex., NMNHS 12357 (Figure A11e) *Gallus gallus*. Dieu. TL: 16.1. *Syrmaticus reevesii*: wider f. a. humeralis. *Polyplectron bicalcaratum*: thicker column scapulae. *Melanoperdix niger*: dimensionally; absence of a longitudinal groove on the most proximal end of the corpus scapulae. *Syrmaticus ellioti*: smaller dimensions; thicker column f. a. humeralis and f. a. clavicularis. *Tragopan*: smaller size and the more triangle, not square, shape of f. a. humeralis. *Arborophila*: considerably smaller. *Gallus gallus*: close resemblance (including dimensionally) to a female specimen of the wild form (Table 15: Figure A2d).

Table 15. Measurements of scapula prox. of fossil and recent Phasianidae (Ref. to Figure A2d).

Species	a	b
Fossil—Dieu		
cf. <i>Bambusicola thoracica</i> NMNHS 12420	5.1	4.3
<i>Syrmaticus</i> cf. <i>humiae</i> NMNHS 12423	8.1	3.4
Phasianidae NMNHS 12357	5.3	2.9
<i>Arborophila</i> cf. <i>brunneopectus</i> NMNHS 12464	4.1	1.7
Phasianidae gen. NMNHS 12484	4.6	2.1
Recent		
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	4.7	4.1
<i>Rollulus roulroul</i> NHMT 1893.4.28.3	ca. 7.3	ca. 4.0
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.5	2.1
<i>Polyplectron bicalcaratum</i> NHMT 1952.2.129	4.8	2.2
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.6	1.6
<i>Polyplectron chalcureum</i> NHMT 1848.10.31.9	-	1.1
<i>Polyplectron malacense</i> NHMT 1997.49.1	4.4	1.9
<i>Chrysolophus auritum</i> NHMT 1868.9.12.25	8.3	3.2
<i>Chrysolophus pictus</i> UCBL (no number)	4.9	2.3
<i>Syrmaticus reevesii</i> NHMT 1851.11.10.54	7.8	3.1
<i>Syrmaticus ellioti</i> NMHT 1944.43.2	7.4	3.2
<i>Syrmaticus ellioti</i> MNHNP 1909/91	6.6	2.7
<i>Syrmaticus soemmerringii</i> NHMT 1860.8.25.7	6.9	-
<i>Phasianus colchicus</i> NHMT	6.2	2.6
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	-	ca. 1.6
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	-	ca. 2.2

Table 15. Cont.

Species	a	b
<i>Gallus gallus gallus</i> NHMT 1989.19.1	6.7	3.3
<i>Gallus gallus jabouillei</i> NHMT 1989.19.1	6.4	3.3
<i>Gallus gallus</i> UCBL 454/1	5.8	2.8
<i>Gallus gallus</i> UCBL 454/3	6.2	2.6
<i>Gallus gallus</i> UCBL 454/4	5.0	2.3
<i>Ithaginis cruentus</i> NHMT 1952.2.101	6.8	-
<i>Tragopan temminckii</i> NHMT 1976.1.1.	6.5	-
<i>Tragopan satyra</i> NHMT 2000.14.7	8.4	4.0
<i>Lophophorus impejanus</i> UCBL	9.1	3.6
<i>Lophura diardi</i> NHMT 1976.32.3	6.6	2.8
<i>Lophura diardi</i> UCBL (no number)	6.1	3.0
<i>Lophura edwardsi</i> NHMT 1997.47.1	5.3	2.8
<i>Lophura nycthemera</i> UCBL (no number)	6.4	3.0
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	5.7	2.9
<i>Perdica asiatica</i> NHMT 1868.9.12.8	2.6	-
<i>Synoicus chinensis</i> NHMT 1985.24.1	-	0.8
<i>Synoicus chinensis</i> NHMT 1992.29.4	1.6	0.8
<i>Fringilla monticola</i> NMNH 343 198	4.4	ca. 1.8
<i>Fringilla pictus</i> NHMT 1896.2.16.47	4.7	-
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	3.6	ca. 1.9
<i>Arborophila brunneopectus</i> NMNH 491868	3.4	2.0
<i>Arborophila brunneopectus</i> NMNH 343998	4.1	-
<i>Rollulus rouloul</i> NMNH 490663	3.5	1.7
<i>Perdix perdix</i> NHMT 1962. 21.1	4.3	1.7
<i>Alectoris graeca</i> NHMT 2959.8.3	3.8	1.5
<i>Pucrasia macrolopha</i> NHMT 1865.12.8.19	6.0	-
<i>Galloperdix bicalcaratum</i> NHMT	-	ca. 1.6
<i>Melanoperdix nigra</i> NMNH 321114	3.1	1.6

Scapula prox. dex., NMNH 12326 *Gallus gallus*. Dieu. *Lophura diardi*: smaller f. a. clavicularis. *Lophura nycthemera*: absence of a pneumatic foramen on the supracoracoideus. *Syrnaticus reevesi*: unclearer dorsal edge of f. a. humeralis. *Lophophorus impejanus*: absence of a constriction on the ventral edge of f. a. humeralis. *Chrysolophus pictus*: more triangle, not more square shape of the f. a. humeralis. *Tragopan caboti* and *Tragopan satyra*: longer column between f. a. humeralis and the f. a. clavicularis; concave lateral surface of the corpus scapulae in its proximal edge. *Rollulus rouloul*: dimensionally; rounded acromion. *Polyplectron bicalcaratum*: longitudinal concavity at the area of the column scapulae. *Polyplectron germaini*: larger size; angular f. a. humeralis. *Phasianus colchicus*: narrower f. a. clavicularis. *Alectoris graeca*: much larger. Completely corresponds to *Gallus gallus* (Table 16; Figure A2e). Scapula prox. dex., NMNH 12428 (Figure A11n) *Gallus gallus*. Dieu, TL: 15.9. *Crossoptilon*: medially curved f. a. clavicularis: more angular f. a. humeralis. *Arborophila brunneopectus*: metrically smaller; rounder f. a. humeralis. *Syrnaticus ellioti* and *Tragopan caboti*: rounder f. a. humeralis; more curved medially crista acromialis (see [21]). *Lophophorus impejanus*: much smaller; lacking of a fossa between f. a. clavicularis

and f. a. humeralis. *Polyplectron germaini*: larger size; angular f. a. humeralis. *Rollulus*, *Alectoris*, *Perdix* and *Francolinus* are of considerably smaller size. *Lophura diardi*: shorter acromion. *Lophura diardi*: longer acromion. *Lophura leucomelanos*: thinner column scapulae. Completely corresponds to *Gallus gallus* (Table 16).

Table 16. Measurements of scapula prox. of fossil and recent Phasianidae (Ref. to Figure A2e).

Species	a	b	c	d
Fossil—Dieu				
<i>Phasianus colchicus</i> NMNHS 12400	ca.12.5	6.7	ca.4.0	6.1
<i>Gallus gallus</i> NMNHS 12326	11.7	6.0	4.2	4.7
<i>Gallus gallus</i> NMNHS 12331	10.8	5.7	ca.5.8	4.9
<i>Gallus gallus</i> NMNHS 12428	10.7	5.6	4.2	4.6
Recent				
<i>Crossoptilon auritum</i> UCBL (no number)	13.9	7.3	4.1	5.8
<i>Lophura erythrophthalmus</i> NHMT 1865.5.10.13	12.0	7.0	4.4	6.1
<i>Phasianus colchicus</i> NHMT 1998.28.1	12.0	6.0	4.8	5.1
<i>Phasianus colchicus</i> NHMT 1999.43.207	14.1	7.4	5.1	5.8
<i>Lophura nycthemera</i> UCBL (no number)	11.3	6.2	4.1	5.5
<i>Lophura edwardsi</i> NHMT 1997.47.1	10.8	6.0	4.0	4.7
<i>Lophura diardi</i> NHMT 1976.32.3	11.2	6.6	4.0	6.1
<i>Lophura diardi</i> UCBL (no number)	13.4	7.2	5.2	6.2
<i>Tragopan satyra</i> NMNHT 2000.14.7	13.5	8.4	5.2	7.0
<i>Polyplectron germaini</i> NHMT 1977.98.1.	8.9	4.2	3.9	3.9
<i>Polyplectron bicalcaratum</i> UCBL (no number)	10.1	4.0	4.0	4.2
<i>Syrnaticus reevesi</i> UCBL (no number)	8.7	3.9	3.2	4.0
<i>Syrnaticus ellioti</i> MNHNP 1901/91	12.2	6.2	4.5	5.8
<i>Lophophorus impejanus</i> UCBL (no number)	16.3	9.2	6.3	6.7
<i>Chrysolophus amherstiae</i> NHMT 1979.45.1	10.5	5.3	4.0	5.1
<i>Chrysolophus pictus</i> UCBL (no number)	9.5	4.6	4.0	4.0
<i>Chrysolophus pictus</i> UCBL 131/5	10.3	5.5	4.5	5.4
<i>Gallus gallus jabouillei</i> NHMT 1989.19.1	12.1	6.1	5.3	5.2
<i>Gallus gallus</i> UCBL 454/1	12.2	5.4	4.1	5.9
<i>Gallus gallus</i> UCBL 454/3	11.5	5.9	3.7	5.8
<i>Gallus gallus</i> UCBL 454/4	9.7	4.3	3.7	4.6
<i>Rollulus rouloul</i> NMNHW 490663	7.3	3.2	3.4	3.7

Tbt. dist. dex. NMNHS 12377 (Figure A11w) *Gallus gallus*. Dieu. TL: 18.1. *Lophura nycthemera*: thicker condylus med. *Lophura erythrophthalmus*: less concave sulcus cartilaginis tibialis. *Lophura diardi*: less concave condylus med. in medial view. *Lophura swinhoi*: narrower incisura intercondylaris; rounder condylus med. *Lerwa lerwa*: larger; less asymmetrical epiphysis in the ventral view. *Chrysolophus pictus*: narrower epiphysis in cranial view. *Crossoptilon auritum*: less-developed epicondylus med. *Syrnaticus ellioti*: rounder than the oval shape of condylus med. *Syrnaticus mikado*: relatively narrower epiphysis. *Syrnaticus reevesi*: narrower incisura intercondylaris. *Lophura ignita rufa*: rounder condylus med.; narrower distal diaphysis. *Tragopan temminckii* and *Tragopan satyra*: smaller; less concave condylus med. *Argusianus argus*: smaller and rounder than the oval shape of condy-

lus med. *Rheinardia ocellata*: narrower epiphysis in the cranial view. *Polyplectron germaini*: larger; straight, not caudally bended distal part of the diaphysis. *Gallus gallus*: complete similarity in the comparison of wild *G. gallus gallus* specimens (Table 3). Radius dist. dex., NMNHS 12394 (Figure A11j) *Gallus gallus*. Dieu. TL: 31.3. It differs from *Crossoptilon*: the lesser bent of the tuberculum aponeurosis ventralis. *Polyplectron bicalcaratum* metrically and wider tuberculum aponeurosis ventralis. Close to *Lophophorus impejanus*: clearly developed toothlet, but it differs from this species by the less dorsal bending of t. aponeurosis ventralis. *Lophura diardi* and *Syrmaticus reevesii*: sharper toothlet on the f. a. radiocarpalis. It differs from *Chrysolophus pictus*: presence of a toothlet. Fully corresponds to wild *Gallus gallus* (Table 17; Figure A2f).

Table 17. Measurements of radius dist. of fossil and recent Phasianidae (Ref. to Figure A2f).

Species	a	b	c	d
Fossil—Dieu				
<i>Gallus gallus</i> NMNHS 12394	2.6	5.7	2.8	2.4
Recent				
<i>Gallus gallus</i> [wild] NHMT 1868.2.19.59	3.2	6.5	3.6	2.3
<i>Gallus gallus</i> UCBL 454/1	3.2	6.0	3.4	2.5
<i>Gallus gallus</i> UCBL 454/3	3.0	5.7	3.1	2.3
<i>Gallus gallus</i> UCBL 454/4	2.6	4.6	2.7	2.0
<i>Polyplectron bicalcaratum</i> UCBL (no number)	2.0	5.0	2.6	1.8
<i>Crossoptilon auritum</i> UCBL (no number)	2.9	6.9	3.6	2.6
<i>Lophura nycthemera</i> UCBL (no number)	2.9	6.4	3.5	2.8
<i>Lophura diardi</i> UCBL (no number)	3.1	7.2	3.9	2.95
<i>Lophophorus impejanus</i> UCBL (no number)	3.3	4.0	4.5	3.2
<i>Syrmaticus reevesii</i> UCBL (no number)	2.4	4.5	2.5	1.8
<i>Chrysolophus pictus</i> UCBL	2.5	5.0	2.6	1.8

Coracoid sternal dex., NMNHS 12316 (Figure A11v) cf. *Gallus gallus*. Dieu. TL: 19.55. *Crossoptilon*: proportionally; absence of a sharp widening on the cranial end of f. a. sternalis. *Lophura nycthemera* and *Lophura diardi*: sharper angulus med. *Syrmaticus reevesii*: presence of a foramen on the sulcus musculi stemocoracoideus. *Polyplectron bicalcaratum*: blunt angulus med. *Lophura edwardsi*: two times thinner f. a. sternalis. *Lophura leucomelanos*: thinner f. a. sternalis. *Lophophorus impejanus*: presence of a clear cranial edge of the pneumatic foramen on the sulcus musculi stemocoracoideus. *Chrysolophus pictus*: absence of a dorsal groove of f. a. sternalis. *Tragopan satyra*: thinned out middle part of the sternal articulation in a ventral view and the shorter and proximally situated angulus lateralis. *Tragopan caboti*: bigger and more caudally situated foramen on the medial surface, but it is similar to the shape of f. a. sternalis. *Phasianus colchicus*: thinner cranial half of the f. a. sternalis. Close to *Gallus gallus*, both in morphology and size (Table 7). Coracoid omal dex., NMNHS 12398 *Gallus gallus*. Dieu. TL: 25.5. A large phasianid, i.e., of Phasianinae. Pr. Acrocoracoideus, is broken and missing. *Alectoris graeca*: smaller and unconcave f. a. humeralis. *Lophura diardi*: wider distal epiphysis at sulcus musculi supracoracoidei. *Chrysolophus pictus*: larger; thicker diaphysis. *Tragopan satyra*: thinner diaphysis; more longitudinal, not transversal, orientation of f. a. humeralis. *Lerwa lerwa*: bigger; relatively thicker diaphysis. *Polyplectron bicalcaratum*: longer acrocoracoidal part. *Gallus gallus*: complete identity (Table 2).

cf. *Gallus* Brisson, 1760 sp. Junglefow

Vertebra cervicalis X NMNHS 12386 (Figure A11x) cf. *Gallus* sp. Dieu. This finding shows the general shape of the 10th cervical vertebra, characteristic for Phasianidae. Right pr. dorsalis and right pr. transversus are broken. *Argusianus argus*: larger. *Polyplectron jermaini*: larger; similar in general. *Polyplectron bicalcaratum*: similar, but the shape of f. a. cranialis is rounder. *Syrmaticus*, *Tragopan*, and *Lophophorus* are larger. *Alectoris graeca*: longer corpus vertebrae. *Gallus gallus*: high similarity (Table 18).

Table 18. Measurements of vertebra cervicalis X of fossil and recent Phasianidae (a—total (maximum by diagonal) length; b—width (in the middle) of f. a. caudalis; c—height (in the middle) of f. a. caudalis).

Species	a	b	c
Fossil—Dieu			
cf. <i>Gallus</i> sp. NMNHS 12386	15.5	-	2.6
Recent			
<i>Polyplectron bicalcaratum</i> NHMT 1952.2.129	15.0	-	-
<i>Polyplectron jermaini</i> NHMT 1977.98.1	11.9	2.8	2.0
<i>Argusianus argus</i> NHMT 1900.7.6.23	19.5	4.0	2.7
<i>Syrmaticus reevesii</i> NHMT 1986.1.1	ca. 18.6	-	-
<i>Alectoris graeca</i> NHMT 1868.9.12.13	13.6	-	-
<i>Gallus gallus</i> NHMT 1999.43.55	15.2	-	-

Phasianus colchicus Linnaeus, 1758 Common Pheasant

This is a resident of south-east W Palearctic and formerly of Soviet C Asia, SE Siberia, Ussuriland, China, Taiwan, N, S Korea, and Japan. It was introduced in Europe, Australia, New Zealand, Hawaii, and N America. IT is a local resident of N (east), E (north-east) Myanmar, and E Tonkin [7] (Supplementary Materials, Map 6). IUCN—LC. Scapula prox. dex., NMNHS 12400 (Figure A11y) *Phasianus colchicus*. Dieu. TL: 21.4. This finding has shorter column scapulae. *Chrysolophus pictus*: more angular (triangle) shape of the f. a. humeralis and rounder shape of facies articulari clavicularis. It differs from *Polyplectron bicalcaratum*: with a wider column scapulae and wider base of this column. *Lophura diardi*: protruded, not concave f. a. humeralis. *Lophura nycthemera*: absence of a foramen. *Syrmaticus reevesii*: unclear dorsal edge of the f. a. humeralis. *Tragopan satyra* and *Lophura erythrophthalmus*: thinner column between the f. a. clavicularis and f. a. humeralis. *Gallus gallus*: smaller f. a. clavicularis. *Syrmaticus mikado* and *Lophura edwardsi*: larger size; angular, not rounded, tip on the ventral edge of f. a. humeralis. *Rheinardia*: absence of pneumatic foramina between the f. a. clavicularis and f. a. humeralis. *Polyplectron jermaini*: larger size; more triangle-like than round shape of f. a. humeralis. *Lophophorus impejanus*: absence of a constriction on the ventral edge of f. a. humeralis. *Chrysolophus pictus*: more triangular than square shape of the f. a. humeralis. *Rollulus rouloul* dimensionally; rounded acromion. High resemblance with *Phasianus colchicus* (Table 16). Tbt. dist. dex. NMNHS 12424 (Figure A12a,b) *Phasianus colchicus* Dieu. TL: 20.1. *Chrysolophus pictus*: dimensionally and wider and blunter epicondylus med. *Polyplectron bicalcaratum*: taller epicondylus med. *Lophura diardi*: wider p. stn.; rounder condylus lateralis. *Lophura nycthemera*: almost twice as long p. stn. *Syrmaticus reevesii*: rounder epicondylus lateralis. *Crossoptilon auritum*: more developed epicondylus lateralis; more medial position of sulcus extensorius. *Lophophorus impejanus*: longer p. stn. *Gallus gallus*: larger epicondylus med. and the smaller distal opening of p. stn. *Syrmaticus ellioti*: dimensions; almost perpendicular axis of the tr. in relation to the axis of diaphysis, i.e., right, not sharp, angle. *Tragopan caboti*: longer p. stn. and its wider connection with condylus lateralis. Full similarity with *Phasianus colchicus* (adult male specimens) (Table 3).

Polyplectron bicalcaratum (Linnaeus, 1758) Grey Peacock-Pheasant

This is a resident of the NE Indian subcontinent and SW China. It is an uncommon to locally fairly common resident of Myanmar, N, NW, NE, S (north) Thailand, Laos, W, E Tonkin, N, and C (northern) Annam [7] (Supplementary Materials, Map 7). IUCN—LC. Humerus dist. sin. NMNHS 12494 (Figure A12c) *Polyplectron bicalcaratum* Dieu. TL: 15.2. *Crossoptilon auritum*: sharper processus flexorius in its caudal end; more transversal orientation of fossa musculus brachialis. *Syrmaticus reevesii*: shallower fossa musculus brachialis. *Lophura nycthemera*: sharper condylus ventralis. *Lophura diardi*: rounder condylus dorsalis. *Gallus gallus*: sharper condylus dorsalis. *Chrysolophus pictus*: deeper sulcus musculi humerotriceps. *Alectoris graeca*: smaller; less developed epicondylus dorsalis, rounder condylus dorsalis. *Lerwa lerwa*: smaller (more flattened) in dorsal view of the condylus dorsalis. *Perdix perdix*: larger; relatively shorter fossa musculus brachialis. *Pternistis bicalcaratus thornei*: similar in size, but with blunter epicondylus ventralis; rounder, not slightly elongated condylus dorsalis. *Polyplectron germaini*: Almost identical, but of a smaller size and rounder epicondylus dorsalis. Almost identical with *Polyplectron bicalcaratum*, but the epicondylus dorsalis has a slightly shallower relief (Table 19: Figure A2g).

Table 19. Measurements of humerus dist. of fossil and recent Phasianidae (Ref. to Figure A2g).

Species	a	b	c
Fossil—Dieu			
<i>Polyplectron bicalcaratum</i> NMNHS 12494	12.2	6.1	4.2
Recent			
<i>Polyplectron bicalcaratum</i> UCBL (no number)	11.8	6.1	5.3
<i>Polyplectron germaini</i> NHMT 1977.98.1	10.7	5.7	4.7
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	11.8	6.6	4.8
<i>Alectoris graeca</i> NHMT 1909.11.18.67	10.3	5.7	4.3
<i>Alectoris graeca</i> NHMT 1954.8.3	10.1	5.4	3.8
<i>Perdix perdix</i> NHMT 1962.21.1	9.8	5.5	4.3
<i>Pternistis bicalcaratus thornei</i> NHMT 1923.11.12.356	11.3	6.1	4.8
<i>Crossoptilon auritum</i> UCBL (no number)	15.8	8.5	6.2
<i>Lophura nycthemera</i> UCBL (no number)	15.7	8.2	5.5
<i>Lophura diardi</i> UCBL (no number)	16.6	8.7	5.8
<i>Lophophorus impejanus</i> UCBL (no number)	18.8	10.3	7.3
<i>Syrmaticus reevesii</i> UCBL (no number)	11.1	5.8	3.9
<i>Chrysolophus pictus</i> UCBL (no number)	11.6	6.0	4.1
<i>Chrysolophus pictus</i> UCBL 131/5	12.9	6.3	4.4
<i>Gallus gallus</i> UCBL 454/1	13.9	7.7	5.8
<i>Gallus gallus</i> UCBL 454/3	13.4	7.1	5.4
<i>Gallus gallus</i> UCBL 454/4	11.6	5.8	4.5

Vertebra cervicalis VII NMNHS 12333 (Figure A12d) *Polyplectron bicalcaratum*. Dieu. TL: 12.1. The morphology shows a Phasianidae species, while the size suggests a medium-sized pheasant. Pr. costales and pr. transversus sinistra are missing. *Argusianus argus*: smaller; shorter pr. articulares caudales. *Lophophorus impejanus*: smaller and slender. *Rheinardia ocellata*: smaller. *Lophura nycthemera*: more caudally inclined pr. transversi. *Lophura diardi*: sharper tips of pr. articulares caudales. *Syrmaticus*, *Ithaginis*, *Tragopan*, *Phasianus*, *Crossoptilon*, and the remaining *Lophura* are also much larger. *Gallus gallus*:

relatively longer. *Polyplectron germaini*: similar, but much larger; longer corpus vertebrae. *Polyplectron bicalcaratum*: complete similarity. Both remaining species of this genus in the region, the Mountain Peacock Pheasant (*Polyplectron inopinatum*) and the Malaysian Peacock Pheasant (*Polyplectron malacense*), have not been compared, but their size is smaller than 5–10 percent [6], while the fossil specimen is also larger than the compared specimen of *Polyplectron bicalcaratum* (Table 20):

Table 20. Measurements of vertebra cervicalis VII of fossil and recent Phasianidae (a—total (maximum by diagonal) length; b—width (in the middle) of f. a. caudalis; c—height (in the middle) of f. a. caudalis).

Species	a	b	c
Fossil—Dieu			
<i>Polyplectron bicalcaratum</i> NMNHS 12333	17.1	3.9	2.5
Recent			
<i>Polyplectron bicalcaratum</i> NHMT 1952.2.129	15.7	3.7	2.0
<i>Polyplectron germaini</i> NHMT 1977.98.1	12.8	2.7	2.0
<i>Argusianus argus</i> NHMT 1900.7.6.23	19.9	4.2	2.9
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	19.2	4.8	2.7
<i>Lophura diardi</i> NHMT 1976.32.3	16.3	4.0	2.6
<i>Lophura nycthemera</i> NHMT 1984.75.1	18.8	3.9	2.8
<i>Gallus gallus</i> NHMT 1999.43.55	16.7	3.2	2.1
<i>Lophophorus impejanus</i> NHMT 1977.19.1	22.0		

Polyplectron cf. *germaini* Elliot, 1866 Germain's Peacock Pheasant

This is endemic. It is a locally common resident in east Cambodia, C (south), S Annam, and Cochinchina [7] (Supplementary Materials, Map 8). IUCN—NT. Cmc. dist. sin. NMNHS 12476 (Figure A12f). *Polyplectron* cf. *germaini*. Dieu. TL: 17.8. *Polyplectron bicalcaratum*: more flattened f. a. metacarpalis minus; shallower incisura on the distal end of os musculus minus. *Lophura diardi*: narrower distal end of spatium intermetacarpalis; absence of a concavity on the lateral end of f. a. dig. minus. *Lophura nycthemera*: more uneven distal end of the shaft (diaphysis) of os metacarpale majus. *Syrnaticus reevesii*: sharper f. a. dig. 2. *Crossoptilon auritum*: dimensionally and wider sulcus tendineus in its distal end. *Lophophorus impejanus*: less prominent f. a. dig. 2. *Gallus gallus*: smaller distal articular face of os metacarpale majus. *Chrysolophus pictus*: wider and more distally bifurcate sulcus tendineus. *Chrysolophus amherstiae*: sulcus tendineus on os metacarpale majus that is slightly wider; narrower f. a. digitalis major. *Polyplectron bicalcaratum*: more flattened f. a. metacarpalis minus; shallower incisura on the distal end of os musculus minus. *Polyplectron chalcum*: similar, but larger; wider os metacarpale majus in its distal part. *Polyplectron germaini*: very similar; slightly larger than the compared female specimen. *Polyplectron napoleonis*: similar; more protruded f. a. dig. major. *Polyplectron malacense*: more symmetrical protruded f. a. dig. major. *Polyplectron germaini*: very similar; slightly larger than the compared female specimen (Table 5).

aff. *Polyplectron* Temminck, 1807 sp. Peacock Pheasant

Synsacrum, os ilium et acetabulum dex., NMNHS 12495 (Figure A12g) aff. *Polyplectron* sp. Dieu. TL: 15.4. The antitrochanter and the acetabulum, as well as the cranial edge of foramen ilioschiadicum are preserved. A middle sized phasianid. *Lophura nycthemera*: narrower lateral (outer) edge of the acetabulum. *Syrnaticus reevesii*: wider antitrochanter. *Chrysolophus pictus*: more angular, not rounded, caudal edge of antitrochanter. *Gallus gallus*: more inclined and sloped antitrochanter; absence of a groove on the os ilium before the antitrochanter. *Rhizothera longirostris*: much smaller. *Alectoris graeca*: wider antitrochanter.

Synoicus chinensis and *P. asiatica*: much larger. *Perdix perdix*, *Francolinus pictus*, and *Rollulus rouloul*: larger; rounder antitrochanter. *Phasianus colchicus*: shorter antitrochanter. *Polyplectron malacense*: antitrochanter without caudal elongation. *Polyplectron germaini* and *P. chalcurum*: similar in general features; less rounded, than cut, dorso-caudal edge of the antitrochanter. *Polyplectron bicalcaratum*: high similarity (Table 21; Figure A2h).

Table 21. Measurements of synsacrum, os ilium of fossil, and recent Phasianidae (Ref. to Figure A2h).

Species	a	b	c	d
Fossil—Dieu				
<i>Polyplectron</i> sp. NMNHS 12495	4.6	5.3	2.7	5.2
Recent				
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.4	5.2	2.2	4.8
<i>Polyplectron bicalcaratum</i> NHMT	4.3	6.0	ca. 3.3	5.2
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.5	4.7	2.3	4.0
<i>Polyplectron malacense</i> NHMT 1997.49.1	4.0	4.4	2.5	3.6
<i>Polyplectron chalcurum</i> NHMT 1848.10.31.9	3.8	4.5	ca. 2.7	4.5
<i>Chrysolophus pictus</i> UCBL (no number)	4.1	4.6	2.4	2.4
<i>Chrysolophus pictus</i> UCBL 131/5	3.9	4.6	2.1	5.5
<i>Syrmaticus reevesii</i> UCBL (no number)	3.8	4.7	2.0	5.6
<i>Gallus gallus</i> UCBL 454/1	3.0	5.5	2.5	6.2
<i>Gallus gallus</i> UCBL 454/3	5.4	5.8	2.4	6.5
<i>Gallus gallus</i> UCBL 454/4	5.4	5.1	2.2	5.1
<i>Lophophorus impejanus</i> UCBL (no number)	3.8	7.2	7.2	8.4
<i>Crossoptilon auritum</i> UCBL (no number)	6.4	7.8	3.0	8.0
<i>Lophura diardi</i> UCBL (no number)	5.3	7.0	3.3	7.3
<i>Lophura nycthemera</i> UCBL (no number)	4.2	6.4	3.4	7.2
<i>Phasianus colchicus</i> NHMT 1998.28.1	5.2	5.8	3.9	3.2
<i>Rollulus rouloul</i> NHMT 1973.66.63	3.7	2.9	3.2	ca. 1.8
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	4.5	5.2	2.6	6.2
<i>Perdix perdix</i> NHMT 1999.43.216	3.7	4.1	2.1	3.3
<i>Francolinus pictus</i> NHMT 1896.2.16.47	3.4	4.0	ca. 2.5	4.4
<i>Alectoris graeca</i> NHMT 1909.11.18.67	4.9	4.4	3.4	-
<i>Synoicus chinensis</i> NHMT 1985.24.1	1.5	-	-	-
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	-	2.7	-	-

Syrmaticus cf. *humiae* Hume, 1881 Mrs Hume's Pheasant

Syrmaticus humiae: Resident of NE India, SW China. It is an uncommon to locally fairly common resident in W, N, C, E Myanmar, and NW Thailand [7]. *Syrmaticus reevesii*: Not spread throughout the region of SE Asia [7] (Supplementary Materials, Map 9). IUCN—NT. Scapula prox. dex., NMNHS 12423 (Figure A12h) Phasianidae gen. Dieu. TL: 11.8. *Crossoptilon auritum*: angular, not oval f. a. humeralis and the shallower f. a. humeralis. *Lophura nycthemera*: absence of an opening at f. a. humeralis and more perpendicular angle and the unsharpened margo dorsalis scapularis. *Lophura diardi*: wider f. a. humeralis. *Polyplectron bicalcaratum*: metrically; thicker column. *Lophophorus impejanus*: absence of the constriction in the area of sulcus supracoracoideus. *Tr. satyra*: metrically; smaller f. a. humeralis; concave lateral surface of corpus scapulae. *Phasianus colchicus* and *Gallus gallus*: presence of a concavity on the facies lateralis of corpus scapulae above the f. a. humeralis.

The fossil specimen is larger than a compared male specimen of *Gallus gallus jabouillei*. *Perdix perdix*, *Bambusicola thoracica*, and *Francolinus pictus* are much larger. *Rhizothera longirostris*: smaller; more angular f. a. humeralis. *Pucrasia macrolopha*: narrower corpus scapulae. *Tragopan caboti*: less concave f. a. humeralis; more concave lateral surface of corpus scapulae in the proximal end. *Tragopan temminckii* and *Ithaginis cruentus*: more angular f. a. humeralis. *Tragopan satyra*: similar; corpus scapulae concaved above f. a. humeralis. *Syrnaticus soemmerringii*: similar; thicker corpus scapulae. *Syrnaticus ellioti*: similar; less concave f. a. humeralis. *S. humiae*: very similar; f. a. more angular (Table 15).

cf. *Lophophorus* Temminck, 1817 sp.

Humerus prox. dex. NMNHS 12363 (Figure A12e) cf. *Lophophorus* sp. Dieu. TL: 28.2. A large phasianid, i.e., a specimen of Phasianinae. Only the proximal half of the diaphysis is preserved. The fragment preserves the inception of crista deltopectoralis and the tendineal facet on the ventro-cranial surface of the diaphysis. *Crossoptilon*: thicker diaphysis; more cranially positioned facet for the inception of the tendon of the muscle on the medial side. *Lophura swinhoii*: more conical than cylindrical shape of the diaphysis in the compared sections. *Lophura diardi*: shallower relief of this facet. *Syrnaticus reevesii*: metrically and shallower relief of this facet (it is slightly concave in *Syrnaticus reevesii*). *Chrysolophus amherstiae*: larger (Table 22; Figure A2i). *Chrysolophus pictus*: thinner distal half of the diaphysis. *Gallus gallus*: shallower facet. *Syrnaticus reevesii*: concave, not prominent, tendineal facet on the ventro-cranial surface of the diaphysis. *Rheinardia ocellata*: wider tendineal facet. *Argusianus argus*: shorter and more bent diaphysis. Very similar to *Lophophorus impejanus*, but the preserved features do not allow us to determine the find further than cf. *Lophophorus* sp.

Table 22. Measurements of humerus prox. of fossil and recent Phasianidae (Ref. to Figure A2i; a—thickness of diaphysis at the inception of crista deltopectoralis; b—minimum width of diaphysis).

Species	a	b
Fossil—Dieu		
cf. <i>Lophophorus</i> sp. NMNHS 12363	7.8	8.5
Recent		
<i>Crossoptilon auritum</i> UCBL (no number)	7.6	7.6
<i>Lophura swinhoii</i> NHMT 1966.55.36	6.6	7.3
<i>Lophura nycthemera</i> UCBL (no number)	6.8	7.6
<i>Lophura diardi</i> UCBL (no number)	7.6	7.5
<i>Syrnaticus reevesii</i> NHMT 1986.1.1	6.9	7.9
<i>Syrnaticus reevesii</i> UCBL (no number)	4.6	5.2
<i>Polyplectron bicalcaratum</i> UCBL (no number)	5.0	5.1
<i>Lophophorus impejanus</i> NHMT	8.4	8.4
<i>Lophophorus impejanus</i> UCBL (no number)	8.4	9.1
<i>Chrysolophus amherstiae</i> NHMT	6.0	5.9
<i>Chrysolophus pictus</i> UCBL (no number)	5.1	5.3
<i>Gallus gallus</i> UCBL 454/1	6.0	6.8
<i>Gallus gallus</i> UCBL 454/3	5.3	5.8
<i>Gallus gallus</i> UCBL 454/4	4.4	5.0
<i>Argusianus argus grayi</i> NHMT 1900.7.6.23	7.5	8.7
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	7.3	8.4

Phasianinae Horsfield, 1821 gen. Pheasants

Cmc. prox. sin. juv., NMNHS 12364 (Figure A12i,j) Phasianinae gen. Dieu. TL: 23.2. *Lophura nycthemera*: shorter processus extensorius. *Lophura diardi*: narrower tr. (measurement “c”). *Syrmaticus reevesii*: lesser bending of pr. extensorius in the ventral direction. *Polyplectron bicalcaratum*: more twisted profile of the tr. carpalis in the cranial view. *Lophophorus impejanus*: narrower tr. *Gallus gallus*: smaller diameter of the tr. condylus ventralis. *Syrmaticus ellioti*: narrower and more elongated pr. extensorius. *Tragopan. caboti*: dimensionally stronger constriction on the condylus med. *Chrysolophus pictus*: bigger pr. estensorius. As the remains of an immature individual, the finding could hardly be identified further than a medium-sized phasianid, Phasianinae gen. (Table 6).

Femur prox. dex. NMNHS 12466 (Figure A12n) Phasianinae gen. Dieu. TL: 22.3. This finding represents a fragment of the diaphysis without a proximal epiphysis. Its dimension (maximum diameter: 7.5) and the preserved features (l. intermuscularis cranialis and linea intermuscularis caudalis) suggest a larger phasianid of a *Gallus gallus gallus* (female) size.

Femur prox. dex. NMNHS 12528 Phasianinae. Dieu. TL: 27.4. This finding represents a fragment of the diaphysis without proximal epiphysis. Its dimension (maximum diameter: 5.7) and the preserved features (l. intermuscularis cranialis and linea intermuscularis caudalis) suggest a larger phasianid of the *Gallus gallus gallus* (female) size.

Tmt sin., NMNHS 12351 (Figure A12l) Phasianinae, male Dieu. TL: 25.0. The only part of the lateral surface with the inception of the spur of the medial sector of the diaphysis is preserved. Sulcus flexorius and linea intermusculares on the caudal surface and the very specific and deep sulcus extensorius on the cranial surface are preserved very well. *Gallus*, *Phasianus*, *Lophura*, *Tragopan*, *Rheinardia*, *Crossoptilon*, *Polyplectron*, *Lerwa*, *Argusianus*, *Tetraogallus*, and *Syrmaticus*: deeper sulcus extensorius (Table 23; Figure A3a).

Table 23. Measurements of tmt. of fossil and recent Phasianidae (Ref. to Figure A3a; a—thickness of the diaphysis at the level of spur, measured medially; b—the width at the same place).

Species	a	b
Fossil—Dieu		
Phasianidae NMNHS 12351	4.3	6.8
Recent		
<i>Lerwa lerwa</i> NHMT 1923.11.16.31	4.2	3.6
<i>Crossoptilon auritum</i> NHMT 1868.9.12.23	ca. 6.4	ca. 4.8
<i>Polyplectron bicalcaratum</i> UCBL (no number)	3.6	2.8
<i>Lophura diardi</i> NHMT 1976.32.3	4.5	ca. 3.9
<i>Syrmaticus ellioti</i> NHMT 1994.63.2	6.1	3.5
<i>Chrysolophus pictus</i> UCBL 131/5	4.2	2.6
<i>Gallus gallus</i> UCBL 454/1	5.8	3.6
<i>Gallus gallus</i> UCBL 454/3	5.7	3.5
<i>Gallus gallus</i> UCBL 454/4	4.6	3.0
<i>Phasianus colchicus</i> NHMT 1999.43.207	5.9	4.9
<i>Rheinardia ocellata</i> NHMT 1926.9.8.1169	ca. 5.2	ca. 3.8
<i>Tragopan satyra</i> NHMT 2000.14.7	6.3	4.9
<i>Lophophorus impejanus</i> UCBL (no number)	6.6	5.8

Scapula prox. sin., NMNHS 12484 (Figure A12k) Phasianinae gen. Dieu. The acromial part has been broken. The preserved details show a medium-sized phasianid. *Polyplectron bicalcaratum*: absence of a clear concavity on facies lateralis and more angular shape of f. a. humeralis. *P. garmaini*: more angular f. a. humeralis. *Alectoris graeca*: thicker

corpus scapulae. *Perdix perdix*: more angular f. a. humeralis. *Lerwa lerwa*: similar in size, but narrower corpus scapulae. *Francolinus pictus*: thicker corpus scapulae. *Phasianus colchicus*: smaller and narrower corpus scapulae. *Lophura diardi*: smaller and of thinner corpus scapulae. *Chrysolophus pictus*: narrower corpus scapulae. *Arborophila brunneopectus*: thicker corpus scapulae; shorter f. a. humeralis. *Melanoperdix niger*: thicker corpus scapulae. *Gallus gallus*: much smaller than wild females of *Gallus gallus*, besides the high morphological resemblance. *Lophura edwardsi*: protruded, not concave facies lateralis of the proximal half of corpus scapulae (Table 15). Tbt prox. sin. NMNHS 12388 Phasianinae gen. Dieu. A splinter of the medial surface of the proximal part of diaphysis. TL: 36.3. The longitudinal edge of the crista cnemialis cranialis along the diaphysis is preserved. Morphological details suggest a large phasianid (Phasianinae). Tmt dist. sin. NMNHS 12362 Phasianidae gen. Dieu. TL: 26.4. Only the thinner part of the diaphysis is preserved. Measurement “a” is measured as the minimum width of the diaphysis; “b” is the height of crista medioplantaris at the same place. *Crossoptilon*: unclear edge between crista medioplantaris and namely the corpus of diaphysis on the medial surface. *Syrmaticus reevesii*: shallow cranial surface. *Chrysolophus pictus*: double, not single, edge laterally of the crista medioplantaris. *Lophura diardi*: similar, but the fragmentarity could only refer the find to Phasianinae (Table 24; Figure A3b).

Table 24. Measurements of tmt. of fossil and recent Phasianidae (Ref. to Figure A3b).

Species	a	b
Fossil—Dieu		
Phasianidae gen. NMNHS 12362	4.9	2.1
Recent		
<i>Crossoptilon auritum</i> UCBL (no number)	5.5	2.9
<i>Lophura nycthemera</i> UCBL (no number)	5.8	2.4
<i>Lophura diardi</i> NHMT 2976.32.3	4.8	2.2
<i>Lophura diardi</i> UCBL (no number)	6.2	4.4
<i>Syrmaticus reevesii</i> UCBL (no number)	4.1	1.7
<i>Polyplectron bicalcaratum</i> UCBL (no number)	3.4	1.6
<i>Lophophorus impejanus</i> UCBL (no number)	6.3	1.8
<i>Chrysolophus pictus</i> UCBL (no number)	4.0	1.7
<i>Gallus gallus</i> UCBL 454/1	5.6	-
<i>Gallus gallus</i> UCBL 454/4	4.6	-

Tbt. dist. sin. NMNHS 12441 Phasianinae gen. Dieu. TL: 20.5. This finding represents a part of the distal third of the diaphysis with sulcus extensorius. It resembles the analogous parts of the large phasianids (Phasianinae) and could not be identified further. Femur prox. dex. NMNHS 12452 (Figure A12m) Phasianinae. Dieu. TL: 28.6. This finding represents a fragment of the diaphysis without proximal epiphysis. The linea intermuscularis cranialis and l. int. caudalis are clearly observed on the fragment. The finding is burnt. Its dimension (maximum diameter: 8.5) and the preserved features (l. intermuscularis cranialis) suggests a larger phasianid of *Phasianus colchicus* (female) size. The find belongs to a large phasianid. *Lophura* and *Syrmaticus*: almost parallel direction of linea intermuscularis cranialis in relation of the longitudinal axis of the diaphysis. The junction is on the proximal end of the cranial surface. It hardly could be determined further (Table 25; Figure A3c).

Table 25. Measurements of femur prox. of fossil and recent Phasianidae (Ref. to Figure A3c; “a—width in the point of the junction of linea intermuscularis cranialis and the line of the distal longitudinal prolongation of crista trochanteris; b—thickness of diaphysis at the same place).

Species	a	b
Fossil—Dieu		
Phasianidae gen. NMNHS 12452	7.9	6.0
Recent		
<i>Polyplectron bicalcaratum</i> UCBL (no number)	5.1	5.7
<i>Chrysolophus pictus</i> UCBL 131/5	7.8	7.7
<i>Chrysolophus pictus</i> UCBL (no number)	7.8	7.7
<i>Syrnaticus reevesii</i> UCBL (no number)	6.5	6.1
<i>Lophophorus impejanus</i> UCBL (no number)	8.4	7.3
<i>Lophura diardi</i> UCBL (no number)	10.0	10.6
<i>Lophura nycthemera</i> UCBL (no number)	9.9	8.2
<i>Gallus gallus</i> UCBL 454/1	6.8	8.0
<i>Gallus gallus</i> UCBL 454/3	6.7	8.1
<i>Gallus gallus</i> UCBL 454/4	6.9	7.2

3.1.2. *Francolinus pintadeanus* (Scopoli, 1786)

Francolinus pintadeanus: Resident of NE India, southern China. Introduced in the Philippines (Luzon) and Mauritius. It is a fairly common to common resident, except in Tennasserim, S Thailand, Peninsular Malaysia, and Singapore [7]. *Francolinus pintadeanus* is the only species of g. *Francolinus*, and is spread throughout the studied region [17]; Supplementary Materials, Map 10). IUCN—LC. Tbt. dist. sin. NMNHS 12430 (Figure A12o) cf. *Francolinus pintadineus*. The epiphysis is missing. TL: 11.6. This finding belongs to smaller phasianids of the Perdicinae subfamily. It differs from *Alectoris*: more medial position of sulcus extensorius and the thicker distal diaphysis. *Lerwa lerwa*: more upright diaphysis; shallower sulcus extensorius. *Bambusicola*, *Rollulus*, and *Galloperdix*: larger size; more medially positioned sulcus extensorius. *Rollulus rouloul*: more medial position of sulcus extensorius. *Syrnaticus reevesii*: protuberance right above the dorsal edge of the p. stn. From *Polyplectron bicalcaratum*: presence of a clear flat surface on the lateral side of diaphysis. *Arborophila*: presence of right lateral edge on the diaphys and the larger size. *Melanoperdix niger*: metrically; right diaphysis in the preserved part. Besides its bad preservation, the fragment could be tentatively referred to as *Francolinus* cf. *pintadineus* (Table 26; Figure A3d).

Table 26. Measurements of tbt. dist. of fossil and recent Phasianidae (Ref. to Figure A3d; a—width of diaphysis in the base of the protuberance right above the dorsal edge of the p. stn.; b—thickness in the same place).

Species	a	b
Fossil—Dieu		
cf. <i>Francolinus pintadeanus</i> NMNHS 12430	5.3	4.2
Recent		
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	5.4	3.6
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	4.1	3.0
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	5.3	3.2

Table 26. Cont.

Species	a	b
<i>Alectoris graeca</i> NHMT 1959.8.3	4.5	3.4
<i>Franclonius francolinus</i> NHMT 1972.1.157	5.1	3.6
<i>Crossoptilon auritum</i> UCBL (no number)	7.9	6.1
<i>Lophura nycthemera</i> UCBL (no number)	7.5	5.0
<i>Syrnaticus reevesii</i> UCBL (no number)	5.3	3.8
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.9	3.7
<i>Lophophorus impejanus</i> UCBL (no number)	7.6	6.3
<i>Chrysolophus pictus</i> UCBL (no number)	5.6	4.3
<i>Gallus gallus</i> UCBL 454/1	7.0	4.8
<i>Gallus gallus</i> UCBL 454/3	7.1	4.3
<i>Gallus gallus</i> UCBL 454/4	5.9	4.2
<i>Arborophila brunneopectus</i> NMNHW 491868	4.5	3.1
<i>Rollulus rouloul</i> NHMT 1973.66.63	4.2	ca. 3.1
<i>Rollulus rouloul</i> NMNHW 490663	4.0	2.9

Alectoris chukar (J. E. Gray, 1830) Chukar Partridge

Not spread in SE Asia [7] (Supplementary Materials, Map 11). IUCN—LC. Humerus dist. sin. NMNHS 12359 (Figure A12p,q) *Alectoris chukar*. Dieu. TL: 17.0. Small phasianid of *Perdicinae*. *Arborophila brunneopectus*: thinner condylus dorsalis, less protruded tuberculum supracondylare ventrale, shallower and more longitudinal orientation of fossa musculus brachialis and the concave bending in the caudal view of the epicondylus dorsalis. *Arborophila torqueola*: larger; wider epicondylus ventralis. *Arborophila javanica*: shallower fossa musculus brachialis; oval and longitudinally oriented epicondylus dorsalis than round, and a less protruding epicondylus dorsalis in the lateral view. *Pucrasia asiatica*, *Coturnix coturnix*, *Synoicus chinensis*, and *Synoicus ypsilophorus*: considerably smaller. *Rollulus rouloul* and *Melanoperdix niger*: thicker incisura intercondylaris, narrower condylus dorsalis and the shallower fossa musculus brachialis. It also differs from the *elanoperdix niger*, with a more elongated processus flexorius. *Polyplectron bicalcaratum*: more angular and elongated condylus dorsalis. *Perdix perdix*: shallower incisura intercondylaris. *Francolinus levaillantii*: Similar in size and general morphology, but the shape of f. musculus brachialis is more oval than elongated. *Francolinus pictus*: wider and more angular epicondylus ventralis. *Lerwa lerwa*: smaller; deeper fossa olecrani. *Alectoris graeca*: close, but differs from that species by the less concave epicondylus dorsalis and rounder articular surface of the pr. supracondylaris dorsalis. *Alectoris rufa*: Similar, but the epicondylus dorsalis in the dorsal view oriented in a more longitudinal than diagonal direction. Rock partridges are not spread at present only in N Vietnam, but in the whole country. Two species (Chukar, *Alectoris chukar* and Rusty-necked Partridge, *Alectoris magna*) occur in N, W, and C China [25]. *Alectoris chukar*: full resemblance. Other species (*Alectoris magna*) with an approaching range are slightly smaller than *Alectoris chukar*. At present, the range of that genus extends to Nepal and C China [26] (Table 27; Figure A3e).

Synsacrum, corpora vertebrorum NMNHS 12322 *Alectoris chukar*. Dieu. TL: 23.5. *Crossoptilon auritum* and *Syrnaticus reevesii*: dimensionally; clearly developed sulcus ventralis synsacri, which is best observed in the sector of the larger (2nd) parapophysis. *Lophura nycthemera* and *Lophura diardi*: well-observed sulcus ventralis synsacri. Close to *Chrysolophus pictus*, but differs from it by a little bit lower inception of the first parapophysis. *Polyplectron*: deeper sulcus ventralis synsacri; more rectangular shape of the f. a. cranialis of the first vertebra of the synsacral corpora vertebrorum. *Lophophorus impejanus*: more protruded cranially corpora vertebrorum before the main (second) parapophysis 2.

Gallus gallus: absence of sulcus ventralis synsacri. *Phasianus colchicus*: deeper sulcus ventralis synsacri and thicker f. a. cranialis of the 1st synsacral vertebra. *Lerwa lerwa*: sulcus ventralis synsacri is strongly developed. Completely corresponds to *Alectoris chukar* (Table 28; Figure A3f). Other species (*Alectoris magna*) with an approaching range is slightly smaller than *Alectoris chukar*.

Table 27. Measurements of humerus dist. of fossil and recent Perdicinae (Ref. to Figure A3e).

Species	a	b	c	d
Fossil—Dieu				
<i>Alectoris chukar</i> NMNHS 12359	10.3	3.1	5.6	3.8
Recent				
<i>Arborophila javanica</i> NHMT 1850.8.15.69	10.0	3.1	5.6	3.9
<i>Arborophila brunneopectus</i> NMNHW 491868	10.1	3.1	5.8	3.9
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	9.0	2.7	4.8	3.3
<i>Rollulus rouloul</i> NMNHW 490663	8.8	3.1	5.3	3.5
<i>Melanoperdix nigra</i> NMNHW 321114	9.6	2.4	4.9	3.6
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	ca. 31.5	3.6	7.0	4.0
<i>Perdix perdix</i> NHMT 1961.21.1	9.9	3.4	5.5	3.7
<i>Francolinus pictus</i> NHMT 1896.2.16.47	9.6	2.8	5.0	3.4
<i>Francolinus levaillantii</i> NHMT 1864.7.18.7	10.8	5.8	5.6	4.3
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	7.3	2.1	3.0	2.6
<i>Alectoris chukar</i> NMNHS 5/1990	10.5	3.5	5.6	3.7
<i>Alectoris chukar</i> NMNHS 13/2011	11.2	3.5	5.7	4.5
<i>Alectoris graeca werae</i> NHMT 1959.8.3	10.3	3.1	5.3	3.8
<i>Alectoris graeca</i> NHMT 1909.11.18.67	10.3	2.7	5.6	4.0
<i>Alectoris graeca</i> NHMT 1896.2.16.49	10.5	3.3	5.8	3.8
<i>Alectoris melanocephala</i> NHMT 1895.12.17.1	13.2	4.1	7.3	4.8
<i>Alectoris rufa</i> NHMT 1999.43.213	9.9	3.5	5.4	3.2
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	9.0	2.6	4.8	3.1
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	5.3	1.6	2.9	2.0

Arborophila brunneopectus (Blyth, 1855) Bar-backed Partridge

This is a resident of SW China. It is an uncommon to locally common resident of S, E Myanmar, Tenassarim, W, NW, NE Thailand, Laos, and Vietnam (except Cochinchina) [7] (Supplementary Materials, Map 12). IUCN—LC. Tbt. dist. sin., NMNHS 12366 (Figure A12y,z) *Arborophila brunneopectus*. Dieu. TL: 21.8. *Bambusicola thoracica*: straight, not bent, diaphysis in its distal fourth. *R. longirostris*: smaller; more slender diaphysis. *Alectoris graeca*: smaller; more symmetrical epiphysis in a ventral view. *Francolinus pictus*: longer articular surface of epiphysis in a caudal view. *Pucrasia asiatica*: much smaller. *Synoicus ypsilophorus*: larger; better developed longitudinal grooves on the lateral surface of the diaphysis. *Melanoperdix niger*: shorter epicondylus med.; wider sulcus extensorius. *Rollulus rouloul*: less concave lateral surface of condylus medialis. *Francolinus pintadeanus*: straight, not caudally bent diaphysis in its distal part; narrower sulcus tendineus on the lateral surface. *Perdix perdix*: wider sulcus extensorius. The preserved features allow us to refer the finding to g. *Arborophila*. *Arborophila torqueola*: high similarity; condylus lateralis of less round shape. *Arborophila javanica*: very similar; narrower distal diaphysis and p. stn. *Arborophila brunneopectus brunneopectus*: complete identity (Table 29).

Table 28. Measurements of synsacrum, corpora vertebrorum (pars cranialis) of fossil, and recent Phasianidae (Ref. to Figure A3f).

Species	a	b	c
Fossil—Dieu			
<i>Alectoris chukar</i> NMNHS 12322	6.9	19.6	5.9
Recent			
<i>Alectoris chukar</i> NMNHS 5/1990	5.7	16.7	4.6
<i>Alectoris chukar</i> NMNHS 13/2011	5.3	18.8	4.8
<i>Alectoris graeca</i> NHMT 1909.11.18.67	5.6	17.3	5.1
<i>Alectoris graeca</i> NHMT 1952.2.48	-	-	5.3
<i>Alectoris graeca</i> NHMT 1868.9.12.13	-	-	5.3
<i>Alectoris graeca werae</i> NHMT 1959.8.3	5.9	16.9	5.3
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	6.1	16.9	5.5
<i>Phasianus colchicus</i> NHMT 1998.28.1	7.5	23.5	6.0
<i>Crossoptilon auritum</i> UCBL (no number)	10.5	23.3	7.7
<i>Lophura nycthemera</i> UCBL (no number)	7.5	23.0	6.7
<i>Lophura diardi</i> UCBL (no number)	7.4	23.9	6.7
<i>Polyplectron bicalcaratum</i> UCBL (no number)	5.7	18.0	5.0
<i>Lophophorus impejanus</i> UCBL (no number)	10.4	24.2	8.8
<i>Syrmaticus reevesii</i> UCBL (no number)	5.7	18.8	5.2
<i>Chrysolophus pictus</i> UCBL (no number)	6.7	24.3	5.2
<i>Chrysolophus pictus</i> UCBL 131/5	7.2	28.2	5.9
<i>Gallus gallus</i> UCBL 454/1	6.0	20.0	6.2
<i>Gallus gallus</i> UCBL 454/3	6.7	19.5	6.5
<i>Gallus gallus</i> UCBL 454/4	5.6	18.3	5.4

Tmt. dist. dex., NMNHS 12391 (Figure A12x) *Arborophila brunneopectos*. Dieu. A medium-sized *Perdicinae* species. *Bambusicola thoracica*: wider distal epiphysis; less elongated tr. metatarsi tertii in cranial view. *Francolinus pintadeanus*: more open (flattened) distal epiphysis. *Rollulus roulroul*: larger and more laterally projected tr. metatarsi IV. All features of g. *Arborophila* are represented. *Arborophila torqueola*: narrower distal diaphysis. *Arborophila javanica*: lesser differences in the diameters of both condyles of tr. metatarsi tertii. *A. brunneopectos brunneopectos*: complete identity (Table 4). Tmt. dist. dex., NMNHS 12390 (Figure A12t) *Arborophila brunneopectus*. Dieu. TL: 23.7. A small phasianid of *Perdicinae*. The finding is covered by a petrified cover of former clay of light brown colour. Measurements follow NMNHS 12334 and NMNHS 12332. *Perdix perdix*: wider distal diaphysis, narrower condyles of tr. mt. tertii. *Polyplectron bicalcaratum*: more relief tr. mt. 4. *Francolinus pintadeanus*: wider epiphysis; more symmetrical tr. mt. tertii in a dorso-cranial view. *Bambusicola thoracica*: larger and less parallel axes of tr. mt. 3 and tr. mt. 4. *Arborophila torqueola*: larger; more rounded tr. metatarsi tertii. *Arborophila javanica*: very similar; narrower incisura intertrochlearis lateralis. *Arborophila brunneopectus brunneopectus*: complete identity (Table 4). Humerus dist. dex., NMNHS 12461 *Arborophila brunneopectus*. Dieu. TL: 27.6. *Polyplectron bicalcaratum*: metrically and shallower relief of the epicondylus ventralis. *Chrysolophus pictus*: larger ventral inclination of condylus dorsalis. *Gallus gallus*: smaller epicondylus dorsalis. *Rollulus roulroul*: thicker diaphysis in its distal end; rounder condylus dorsalis and shorter condylus ventralis. *Perdix perdix*: thicker diaphysis. *Rhizothera longirostris*: much smaller. *Alectoris graeca*: sharper, not rounded condylus dorsalis in its proximal end. *Melanoperdix niger*: wider column and the more elongated

processus flexorius. *Lerwa lerwa*: smaller; rounder condylus dorsalis. *Bambusicola thoracica*: thicker diaphysis. *Arborophila torqueola*: close, but smaller; thicker epicondylus ventralis. *Francolinus pictus*: rounder condylus dorsalis in a caudal view. *Polyplectron bicalcaratum*: shallower fossa musculus brachialis in the distal end. *Arborophila brunneopectus*: complete identity (Table 30; Figure A3g).

Table 29. Measurements of tbt. dist. of fossil and recent *Perdicinae* (Ref. to Figure A2).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Arborophila brunneopectus</i> NMNHS 12366	7.1	ca. 5.4	7.0	6.6	3.4
<i>Arborophila</i> sp.- 2 NMNHS 12335	-	ca. 5.7	6.5	-	-
Recent					
<i>Arborophila brunneopectus</i> NMNHW 491868	7.3	5.6	7.2	7.0	3.8
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	6.3	4.9	7.2	6.3	3.3
<i>Rollulus rouloul</i> NMNHW 490663	6.2	5.2	6.1	5.8	3.2
<i>Arborophila javanica</i> NHMT 1850.8.15.69	6.9	6.2	7.3	6.6	4.5
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	6.1	6.2	6.1	5.8	3.1
<i>Alectoris graeca</i> NHMT 1909.11.18.67	7.1	5.8	7.2	7.0	3.9
<i>Perdix perdix</i> NHMT 1962.21.1	7.2	5.6	6.7	7.2	3.5
<i>Francolinus pictus</i> NHMT 1896.2.16.47	6.1	5.2	7.0	6.4	3.4
<i>Perdica asiatica</i> NHMT 1868.9.12.8	4.0	3.3	3.9	3.7	2.3
<i>Alectoris graeca</i> NHMT 1909.11.18.67	7.6	5.7	8.0	7.2	4.0
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	7.5	5.5	6.6	6.0	3.4
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	5.2	4.1	5.6	5.0	3.8
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	8.6	7.3	9.1	8.2	4.6
<i>Ammoperdix heyi</i> NHMT 1865.12.8.17	-	4.1	-	-	2.6
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	6.4	5.3	6.7	6.2	3.2
<i>Melanoperdix nigra</i> NMNHW 321114	6.0	4.2	6.3	5.9	3.0

Table 30. Measurements of humerus dist. of fossil and recent *Phasianidae* (Ref. to Figure A3g); d—width of diaphysis in the middle; e—thickness of diaphysis in the middle).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Arborophila brunneopectus</i> NMNHS 12461	10.6	6.0	3.8	5.4	4.1
Recent					
<i>Arborophila javanica</i> NHMT 1850.8.15.69	9.8	5.5	3.9	5.0	3.8
<i>Arborophila brunneopectus</i> NMNHW 491868	10.1	5.8	3.9	5.0	3.8
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	8.8	4.6	3.3	3.3	3.1
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	11.7	6.2	4.1	5.7	4.1
<i>Polyplectron bicalcaratum</i> UCBL (no number)	11.8	6.1	4.2	5.0	4.4
<i>Chrysolophus pictus</i> UCBL (no number)	11.6	6.0	4.2	5.4	4.4
<i>Chrysolophus pictus</i> UCBL 131/5	12.8	6.5	4.4	6.0	4.9

Table 30. Cont.

Species	a	b	c	d	e
<i>Syrnaticus reevesii</i> UCBL (no number)	11.0	5.7	4.0	5.4	4.2
<i>Gallus gallus</i> UCBL 454/1	13.9	7.7	5.8	6.7	5.6
<i>Gallus gallus</i> UCBL 454/3	13.4	7.1	5.4	5.9	4.7
<i>Gallus gallus</i> UCBL 454/4	11.6	5.8	4.5	4.9	4.2
<i>Lophophorus impejanus</i> NHMT 1977.19.1	18.8	10.6	7.4	9.4	7.6
<i>Lophura diardi</i> UCBL (no number)	16.6	8.7	5.8	7.8	7.2
<i>Lophura nycthemera</i> UCBL (no number)	10.6	6.0	3.8	5.4	4.1
<i>Rollulus rouloul</i> NMNHW 490663	8.7	5.3	3.5	4.5	3.7
<i>Melanoperdix nigra</i> NMNHW 321114	9.5	5.0	3.5	4.4	3.6
<i>Alectoris graeca</i> NHMT 1909.11.18.67	10.4	5.5	3.9	3.9	3.8
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	9.0	4.6	3.0	4.2	3.3
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	17.3	6.8	4.8	6.5	5.2
<i>Perdix perdix</i> NHMT 1999.43.216	10.3	5.6	3.5	4.5	3.7
<i>Francolinus pictus</i> NHMT 1896.2.16.47	9.3	5.0	3.3	4.6	4.0
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	8.9	4.7	3.1	4.0	3.3

Cmc. prox. dex., NMNHS 12463 (Figure A12s) *Arborophila brunneopectus*. Dieu. TL: 10.7. *Chrysolophus pictus*: less cranially protruded processus extensorius. Phasianid of smaller size, i.e., *Perdicinae*. *Coturnix*, *Synoicus* (incl. former *Excalfactoria*), and *Perdicula* are much smaller in size. *Rollulus rouloul*: more curved cranially processus extensorius. *Polyplectron bicalcaratum*: larger; rounder, than angulate, transverse section of os metacarpale majus at the proximal metacarpal symphysis. *Perdix perdix*: relatively longer; not bent medially pr. extensorius. *Alectoris graeca*: wider tr. carpalis. Complete resemblance with *Arborophila brunneopectus* (Table 6). Tbt. dist. dex. NMNHS 12367 *Arborophila brunneopectus*. Dieu. TL: 22.5. *Rollulus rouloul*: deeper sulcus extensorius; more asymmetrical tr. in a ventral view. *Melanoperdix niger*: absence of a well developed epicondylus med; wider incisura intercondylaris. *Polyplectron bicalcaratum*: relatively narrower; less symmetrical distal epiphysis. *Pucrasia asiatica*: much larger. *Alectoris graeca*: less asymmetrical distal epiphysis. *Perdix perdix*: less elliptical, than round, condylus lateralis. *Francolinus pictus*: more longitudinally directed condylus med. in a caudal view. *Bambusicola thoracica*: thicker, more upright and more robust distal diaphysis. *Arborophila torqueola*: thicker distal diaphysis; clearer developed lineae intermusculares. *Arborophila javanica*: very high resemblance. Tmt. dist. sin., NMNHS 12392. *Arborophila brunneopectus*. Dieu. *Francolinus pictus*: wider diaphysis in its distal part; more asymmetrical tr. mt. tertii. *Rhizothera longirostris*: smaller; more distally positioned foramen vasculare distale. *Ammoperdix heyi*: larger; more flattened distal part of the diaphysis. *Polyplectron bicalcaratum*: of the same size, but has a flattened distal part of the diaphysis. *Pucrasia asiatica*, *Synoicus ypsilophorus*, and *Coturnix coturnix*: much larger. *Bambusicola thoracica*: relatively longer tr. mt. IV. *Rollulus rouloul*: more flattened distal part of the diaphysis and wider distal epiphysis. *Arborophila torqueola*: close, but more robust and large, and has a deeper relief of tr. mt. musculustertii in the cranial view. *Arborophila javanica*: similar, but slightly narrower tr. mt. tertii. *Arborophila brunneopectus*: full similarity (Table 4). Cmc. prox. sin., NMNHS 12474 (Figure A12v,w) *Arborophila brunneopectus*. Dieu. TL: 9.2. This finding preserves only the proximal epiphysis and the inception of os metacarpale majus and os metacarpale minus. Dimensions refer it to *Perdicinae*. *Arborophila torqueola*: larger; sharper pr. pisiformis. *Rhizothera longirostris*: presence of a crevice-like constriction in the synostosis metacarpalis prox. *Alectoris graeca*: protruded, not concave profile of tr. carpalis in the cranial view. *Francolinus pictus*: longer and sharper pr. extensorius. *Rollulus rouloul*: much larger.

Perdix perdix: similar in size; distal end of pr. alularis is much thicker. *Synoicus ypsilophorus* and *Pucrasia asiatica*: much larger. *Polyplectron bicalcaratum*: larger; round, not circular section of os metacarpale majus. *Lerwa lerwa*: shorter pr. extensorius; shorter synostosis metacarpalis prox. *Bambusicola thoracica*: much larger. *Arborophila torqueola*: very similar, but larger. *Arborophila javanica*: complete identity, besides the slightly larger dimensions. *Polyplectron bicalcaratum*: larger; round, not circular section of os metacarpale majus (Table 6). Coracoid dex., NMNHS 12369 (Figure A12u) *Arborophila brunneopectus*. Dieu. TL: 33.7. The bone is almost completely preserved, except the acrocoracoidal part of the distal (humeral) epiphysis. A small phasianid, i.e., the finding, belongs to the *Perdicinae* subfamily. *Polyplectron bicalcaratum*: thicker profile of f. a. sternalis in a ventral view; shallower relief f. a. humeralis. *Polyplectron germaini*: maximum width of f. a. sternalis in the cranial, not in the medial part in the ventral view. *Chrysolophus pictus*: less developed sterno-coracoidal impression and furrowing of the sulc. musculussternocoracoideus. *Gallus gallus*: sharper cranial edge of f. a. sternalis. *Rollulus rouloul*: size; thicker cranial edge of f. a. sternalis. *Polyplectron bicalcaratum*: larger; thicker diaphysis. *Synoicus ypsilophorus*: larger; much more shallow curve of f. a. sternalis. *Melanoperdix niger*: thicker cranial end of f. a. sternalis, thicker diaphysis and less concave sulcus musculus sternocoracoideus. *Pucrasia asiatica*: much larger. *Perdix perdix*: narrower f. a. sternalis. *Rhizothera longirostris*: smaller; less concave f. a. sternalis in a lateral view. *Francolinus pictus*: wider f. a. sternalis. *Bambusicola thoracica*: larger; thicker cranial part of f. a. sternalis. *Alectoris graeca*: shorter pr. lateralis; more angular lateral edge of f. a. sternalis in ventral view. *Rollulus rouloul*: thicker diaphysis. *Arborophila torqueola*: slightly larger; more robust diaphysis. *Arborophila brunneopectus*: complete identity, both in morphology and size (Table 31; Figure A3h).

Table 31. Measurements of coracoid of fossil and recent *Perdicinae* Ref. to Figure A3h; b—minimum width of diaphysis).

Species	a	b	c	d
Fossil—Dieu				
<i>Arborophila brunneopectus</i> NMNHS 12369	30.6	3.4	5.0	ca.8.2
Recent				
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	22.7	2.7	-	6.9
<i>Polyplectron bicalcaratum</i> UCBL (no number)	35.5	3.8	5.6	8.9
<i>Polyplectron germaini</i> NHMT 1977.98.1	29.5	3.2	4.8	4.3
<i>Syrmaticus reevesii</i> UCBL (no number)	31.3	3.6	6.0	9.7
<i>Chrysolophus pictus</i> UCBL (no number)	32.7	3.6	ca.5.6	ca.9.2
<i>Chrysolophus pictus</i> UCBL 131/5	32.4	3.8	6.0	10.5
<i>Rollulus rouloul</i> NMNHW 490663	27.4	2.9	4.4	7.3
<i>Alectoris graeca</i> NHMT 1868.9.12.13	37.0	3.2	-	9.2
<i>Melanoperdix nigra</i> NMNHW 321114	29.0	2.7	4.3	7.8
<i>Gallus gallus</i> UCBL 454/1	45.0	5.0	-	10.7
<i>Gallus gallus</i> UCBL 454/3	37.4	3.6	5.0	8.4
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	27.3	2.9	-	7.7
<i>Rollulus rouloul</i> NHMT 1973.66.63	28.8	2.3	-	7.8
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	36.9	4.0	-	10.1
<i>Perdix perdix</i> NHMT 1999.43.216	31.6	3.2	5.8	7.9
<i>Francolinus pictus</i> NHMT 1896.2.16.47	ca. 29.8	2.9	-	7.5

Table 31. Cont.

Species	a	b	c	d
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	ca. 24.0	2.3	-	6.2
<i>Alectoris graeca</i> NHMT 1868.9.12.13	34.2	3.2	6.7	9.3
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	-	3.0	-	-
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	ca. 17.5	ca. 1.9	-	-

Tbt. dist. sin. NMNHS 12431 (Figure A12r) *Arborophila brunneopectus*. Dieu. TL: 19.3. A fragment of the distal part of the diaphysis. Canalis extensorius is well preserved on the fragment. Canalis extensorius is preserved. The finding is broken immediately above the p. stn. The size suggests a small phasianid (Perdicinae). *Polyplectron bicalcaratum*: shallower sulcus extensorius. *Rollulus rouloul*: more medially positioned sulcus extensorius. *Melanoperdix niger*: metrically and right diaphysis of the preserved fragment. *Alectoris graeca*: slender and smaller. *Lerwa lerwa*: general similarity in size and morphology, but the lineae intermusculares are more clearly developed on the cranial surface of the diaphysis. *Arborophila brunneopectus brunneopectus*: rounder edges enclosing sulcus extensorius. *Arborophila javanica*: high similarity. Because of its fragmentarity, the find could be at least referred to g. *Arborophila*. Two species of that genus are spread in Vietnam [9]: *Arborophila merlini* and *Tropicoperdix charltonii*; unfortunately, both remained uncomparated for this study. [6,26] accept the distribution of *Arborophila brunneopectus* widely throughout SE China and the whole N and C of Vietnam. Even more, in [6], *Arborophila torqueola* and *Arborophila rufogularis* are reported to be spread in NW Tonkin (i.e., N Vietnam) (Table 32; Figure A3i).

Table 32. Measurements of tbt. dist. of fossil and recent Phasianidae (Ref. to Figure A3i; a—width; b—thickness in the distal fourth of diaphysis).

Species	a	b
Fossil—Dieu		
<i>Arborophila brunneopectus</i> NMNHS 12431	4.1	3.7
Recent		
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	4.9	3.8
<i>Alectoris graeca</i> NHMT 1952.2.48	5.0	3.9
<i>Syrnaticus reevesii</i> UCBL (no number)	5.8	3.7
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.9	3.6
<i>Lophophorus impejanus</i> UCBL (no number)	8.6	5.9
<i>Chrysolophus pictus</i> UCBL (no number)	6.2	4.3
<i>Gallus gallus jabouillei</i> NHMT 1989.19.1	6.4	4.7
<i>Arborophila javanica</i> NHMT 1850.8.15.69	4.5	3.8
<i>Arborophila brunneopectus</i> NMNHW 491868	4.8	3.8
<i>Melanoperdix nigra</i> NMNHW 321114	3.7	2.8

Arborophila cf. *brunneopectus* (Blyth, 1855) Bar-Backed Partridge

This is a resident of SW China and is a uncommon to locally common resident of S, E Myanmar, Tenassarim, W, NW, NE Thailand, Laos, and Vietnam (except Cochinchina) [7]. Scapula prox. sin., NMNHS 12464 (Figure A13a) *Arborophila* cf. *brunneopectus*. Dieu. TL: 25.5. *Chrysolophus pictus*: narrower corpus scapulae. *Polyplectron bicalcaratum* and *Polyplectron chalcum*: thicker column scapulae. *Polyplectron malacense*: angular, not rounded f. a. humeralis. The finding can be metrically referred to Perdicinae *Rollulus rouloul*:

angular (triangle) shape of f. a. humeralis; shallower longitudinal groove on corpus scapulae of the proximal end. *Melanoperdix niger*: higher column scapulae. *Francolinus pictus* and *Bambusicola thoracica*: thicker corpus scapulae; deeper longitudinal concavity on facies lateralis of corpus scapulae. *Perdix perdix*: sharper f. a. clavicularis; deeper longitudinal concavity on facies lateralis of corpus scapulae. *Synoicus ypsilophorus*: thicker corpus scapulae. *Polyplectron bicalcaratum*: corpus scapulae in proximal third is not concaved. *Rollulus rouloul*: thicker corpus scapulae. *Rhizothera longirostris*: much smaller. *Pucrasia asiatica*, *Synoicus chinensis*, and *Coturnix coturnix*: larger. *Arborophila torqueola*: similar; slightly larger. *Arborophila brunneopectus*: considerable similarity (Table 15). Humerus prox. sin. NMNHS 12471 (Figure A13b) *Arborophila cf. brunneopectus*. TL: 31.6. Fossa pneumotricipitalis is filled and covered by petrified clay. *Rollulus rouloul*: deeper sulcusligamenti transversus; longer crista deltopectoralis. *Melanoperdix niger*: thinner crista deltopectoralis in its distal end; more protruded tuber dorsale. *Bambusicola thoracica*: larger; rounder ventral part of caput humeri. *Gallus gallus*: much smaller; deeper and better shaped fossa pneumotricipitalis. *Francolinus pictus*: more protruded intumescencia. *Polyplectron bicalcaratum*: more medially positioned tendineal facet on facies med. *Alectoris graeca*: shorter crista pectoralis; less prominent intumescencia. *Rhizothera longirostris*: smaller; more slender diaphysis. *Perdix perdix*: better developed fossa pneumotricipitalis. *Pucrasia asiatica*: much larger. *Arborophila torqueola*: similar; slightly larger. *Arborophila javanica*: complete similarity. *Arborophila brunneopectus*: smaller crista deltopectoralis; less prominent caput humeri (Table 33; Figure A4a).

Table 33. Measurements of humerus prox. of fossil and recent *Perdicinae* (Ref. to Figure A4a).

Species	a	b	c	d
Fossil—Dieu				
<i>Arboroophila cf. brunneopectus</i> NMNHS 12471	9.5	5.7	13.0	6.9
Recent				
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	8.6	5.4	11.4	6.4
<i>Arborophila javanica</i> NHMT 1850.8.15.69	10.0	4.8	12.8	6.3
<i>Arborophila brunneopectus</i> NMNHW 491868	10.1	6.0	13.0	7.2
<i>Rollulus rouloul</i> NMNHW 490663	9.1	4.9	11.8	6.0
<i>Melanoperdix nigra</i> NMNHW 321114	8.7	4.9	11.5	6.2
<i>Alectoris graeca</i> NHMT 1909.11.18.67	10.4	5.4	13.5	6.4
<i>Gallus gallus</i> NHMT 1868.2.19.59	13.4	7.7	17.8	8.8
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	8.4	4.8	10.9	5.8
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	12.6	6.6	16.0	7.4
<i>Perdix perdix</i> NHMT 1999.43.216	9.5	5.2	13.8	6.2
<i>Francolinus pictus</i> NHMT 1896.2.16.47	9.1	5.0	12.3	6.1
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	8.4	4.7	11.0	5.7
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	5.1	2.0	3.6	6.5

Arborophila torqueola (Valenciennes, 1826) Hill Partridge

This is a resident of the N, NE Indian subcontinent, S, SE Tibet, and SW China. It is a locally common resident of W, N Myanmar, and W Tonkin [7] (Supplementary Materials, Map 13). IUCN—LC. Tmt. dist. sin., NMNHS 12500 (Figure A13c) *Arborophila torqueola*. Dieu. Distal half with tr. mt. II is preserved. The find shows typical features for small phasianids. *Rhizothera longirostris* and *Alectoris graeca*: much smaller. *Synoicus ypsilophorus*: slightly larger; more flattened distal epiphysis. *Francolinus francolinus*: smaller; more flattened distal epiphysis. *Pucrasia asiatica*: much larger. *Perdix dauurica*: simi-

lar in size; wider distal part of diaphysis; more cranially protruded tr. mt. musculus tertii. *Arborophila brunneopectus*: smaller; slender, and more flattened distal diaphysis. *Arborophila torqueola*: identical (Table 4).

Arborophila cf. *torqueola* (Valenciennes, 1826) Hill Partridge

The is a resident of the N, NE Indian subcontinent, S, SE Tibet, and SW China. It is a locally common resident of W, N Myanmar, and W Tonkin [7]. Humerus prox. sin., NMNHS 12354 (Figure A13d) *Arborophila* cf. *torqueola*. Dieu. TL: 13.5. A small phasianid. *Rollulus rouloul*: absence of a sharp inception of crista deltopectoralis. *Melanoperdix niger*: narrower crista deltopectoralis and more protruded tuberculum dorsale. *Bambusicola thoracica*: less prominent caput humeri. *Arborophila javanica*: less prominent caput humeri. *Synoicus ypsilophorus*: larger; shallower fossa pneumotricipitalis. *Polyplectron bicalcaratum*: less rounded ventral part of caput humeri. *Rhizothera longirostris*: much smaller; thinner and even crista pectoralis. *Pucrasia asiatica*: much larger. *Perdix perdix*: cranial (distal) edge of fossa pneumotricipitalis better developed. *Rollulus rouloul*: round, not angular, profile of crista pectoralis. *Ammoperdix heyi*: larger; shallower fossa pneumotricipitalis. *Francolinus pictus*: more distally positioned fossa pneumotricipitalis; less prominent caput humeri. *Alectoris graeca*: less prominent caput humeri; rounded, not angular, crista pectoralis. *Arborophila*: shallower fossa pneumotricipitalis (1) and by its more cranial (i.e., proximal) position, as well as the shallower sulcus ligamenti transversus. *Arborophila torqueola*: complete similarity (Table 34; Figure A4b).

Table 34. Measurements of humerus prox. of fossil and recent *Perdicinae* (Ref. to Figure A4b; a—width between the t. dorsale and t. ventrale).

Species	a	b
Fossil—Dieu		
<i>Arborophila</i> cf. <i>torqueola</i> NMNHS 12354	4.8	10.3
Recent		
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	4.5	11.1
<i>Arborophila javanica</i> NHMT 1850.8.15.69	5.3	11.8
<i>Arborophila brunneopectus</i> NMNHW 491868	5.4	11.1
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	4.8	12.0
<i>Rollulus rouloul</i> NMNHW 490663	4.8	10.0
<i>Melanoperdix nigra</i> NMNHW 321114	4.7	9.7
<i>Rollulus rouloul</i> NHMT 1973.66.63	4.7	10.7
<i>Perdix perdix</i> NHMT 1962.21.1	5.1	7.5
<i>Francolinus pintadineus</i> NMNHW 343198	5.4	11.7
<i>Francolinus pictus</i> NHMT 1896.2.16.47	5.1	12.7
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	2.8	6.5
<i>Alectoris graeca</i> NHMT 1909.11.18.67	5.5	12.7
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	4.9	11.6
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	3.8	8.5
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	6.6	16.4
<i>Ammoperdix heyi</i> NHMT 1865.12.8.17	3.9	9.3
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	4.4	10.7

Tbt. sin., NMNHS 12370 (Figure A13e) *Arborophila* cf. *torqueola*. Dieu. TL: 40.7. Both epiphyses are not preserved, but the inception of the crista fibularis is clearly observed.

Polyplectron bicalcaratum and *Bambusicola fytchii*: metrically and relatively shorter diaphysis towards the distal end of the criss fibularis and distal epiphysis. *Chrysolophus pictus*: more clearly developed sulcus extensorius. *Polyplectron germaini*: larger. *Synoicus ypsilophorus*: thicker diaphysis in the distal end. *Rollulus rouloul*: more upright diaphysis in the distal end. *Melanoperdix niger*: more bent diaphysis in the cranio-caudal direction. *Bambusicola thoracica*: straight, not bended diaphysis in a lateral view. *Perdix perdix*, *Rhizothera longirostris*, *Alectoris graeca*: larger. *Polyplectron germaini*: larger. *Polyplectron bicalcaratum*: similar in size; more slender diaphysis. *Francolinus pictus*: deeper sulcus extensorius. *Arborophila brunneopectus*: very similar; slightly smaller. *Arborophila torqueola*: complete similarity (Table 35; Figure A4c).

Table 35. Measurements of tbt. of fossil and recent *Perdicinae* (Ref. to Figure A4c; a—minimum width of diaphysis; b—minimum thickness of diaphysis).

Species	a	b
Fossil—Dieu		
<i>Arborophila</i> cf. <i>torqueola</i> NMNHS 12370	3.3	3.2
Recent		
<i>Arborophila torqueola</i> NHMT 18962.16.53	3.1	2.7
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	3.4	3.0
<i>Arborophila javanica</i> NHMT 1850.8.15.69	4.5	3.6
<i>Arborophila brunneopectus</i> NMNHW 491868	3.6	3.6
<i>Lophura nycthemera</i> UCBL (no number)	6.5	6.3
<i>Polyplectron bicalcaratum</i> UCBL (no number)	4.1	3.6
<i>Lophophorus impejanus</i> UCBL (no number)	7.0	6.0
<i>Chrysolophus pictus</i> UCBL (no number)	4.5	4.2
<i>Melanoperdix nigra</i> NMNHW 321114	3.1	2.8
<i>Gallus gallus</i> UCBL 454/3	5.5	4.3
<i>Rollulus rouloul</i> NMNHW 490663	3.1	2.8
<i>Francolinus pintadineus</i> NMNHW 343198	3.5	3.5
<i>Francolinus pictus</i> NHMT 1921.4.21.14	3.7	3.0
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	2.9	2.5
<i>Alectoris graeca</i> NHMT 1909.11.18.67	3.4	2.9
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.6	3.5
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	4.5	4.3
<i>Perdix perdix</i> NHMT 1999.43.216	3.8	3.2
<i>Bambusicola thoracica</i> NHMT 1841.10.20.1.	3.1	2.7
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	3.8	2.8

Furcula (clavicula sin.) NMNHS 12451 (Figure A13f) *Arborophila* cf. *torqueola*. Dieu. TL: 13.6. Only the left sternal half together with the symphysis furculae are preserved. *Polyplectron bicalcaratum*: larger; absence of a cranial inclination (1). *Pluplectron chalcurnum*: wider symphysal part. *Polyplectron germaini*: wider symphysal part. *Chrysolophus pictus*: rounded, not edged section of the clavicula. *Rollulus rouloul* and *Melanoperdix niger*: smaller hypocleidium. Dimensions suggest *Perdicinae*. *Polyplectron bicalcaratum*: round, not flattened scapus claviculae. *Francolinus pictus*: larger bifurcation of the furcula. *Rollulus rouloul*: wider synostosis interclavicularis. *Pucrasia asiatica*: much smaller. *Ammoperdix heyi*: thicker scapus claviculae. *Rhizothera longirostris*: smaller; has a medial edge on the caudal surface of the synostosis interclavicularis. *Bambusicola thoracica*: scapus claviculae not concaved on

the caudal surface at the synostosis interclavicularis. *Arborophila brunneopectus*: high similarity; smaller. *Arborophila torqueola*: similar in size and morphology (Table 36; Figure A4d).

Table 36. Measurements of clavicle of fossil and recent Phasianidae (Ref. to Figure A4d).

Species	a	b
Fossil—Dieu		
<i>Arborophila</i> cf. <i>torqueola</i> NMNHS 12451	1.6	1.4
Recent		
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	2.0	1.4
<i>Arborophila brunneopectus</i> NMNHW 491868	1.7	1.4
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	1.8	1.4
<i>Polyplectron germaini</i> NHMT 1977.98.1	1.7	1.5
<i>Polyplectron halcurnum</i> NHMT 1848.10.31.9	1.7	1.5
<i>Polyplectron bicalcaratum</i> UCBL (no number)	1.5	1.6
<i>Chrysolophus pictus</i> UCBL 131/5	2.3	1.6
<i>Chrysolophus pictus</i> UCBL (no number)	1.6	1.4
<i>Gallus gallus</i> UCBL 454/1	2.0	2.3
<i>Gallus gallus</i> UCBL 454/3	2.7	2.9
<i>Gallus gallus</i> UCBL 454/4	2.4	2.5
<i>Rollulus rouloul</i> NHMT 1973.66.63	1.4	1.7
<i>Rollulus rouloul</i> NMNHW 490663	1.2	1.4
<i>Melanoperdix nigra</i> NMNHW 321114	1.6	1.4
<i>Synoicus chinensis</i> NHMT 1992.29.4	0.7	0.8
<i>Francolinus pictus</i> NHMT 1896.2.16.47	1.5	1.6
<i>Francolinus pintadineus</i> NMNHW 343198	1.6	1.5
<i>Ammoperdix heyi</i> NHMT 1865.12.8.17	1.2	0.9
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	1.7	1.5
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	3.3	2.2
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	1.5	1.2
<i>Perdica asiatica</i> NHMT 1868.9.12.8	1.2	1.0

Arborophila Hodgson, 1837 sp.—1 (Distinct from *Arborophila torqueola*)

Coracoid dist. dex., NMNHS 12368 (Figure A13g) *Arborophila* sp.—1 (distinct from *Arborophila torqueola*). Dieu. TL: 17.8. *Syrnaticus reevesii*: smaller; less protruded f. a. humeralis. *Polyplectron bicalcaratum*: smaller; shallower relief of f. a. humeralis; the shorter acromial part. *Polyplectron germaini*: similar in size; much narrower acrocoracoidal part; more relief cotyla scapularis. *Chrysolophus pictus*: smaller; more ventrally protruded acrocoracoidal end. *Rollulus rouloul*: bigger processus acrocoracoideus; deeper sulcus musculi supracoracoideus; more cylindrical cranial part of diaphysis. *Melanoperdix niger*: deeper sulcus on pr. acrocoracoideus; larger pr. acrocoracoideus. *Pucrasia asiatica*: larger. *Alectoris graeca*: shorter acrocoracoidal part. *Gallus gallus*: smaller; better developed and longer impressio ligamenti acrocoracohumeralis. *Perdica asiatica* and *Synoicus chinensis*: much bigger. *Perdix perdix*: smaller; narrower f. a. humeralis and f. a. clavicularis. *Polyplectron bicalcaratum*: wider acrocoracoidal part. *Synoicus ypsilophorus*: larger; wider acrocoracoidal part. *Rhizothera longirostris*: smaller; more open sulcus musculi supracoracoidei. *Bambusicola thoracica*: wider acrocoracoidal part. *Francolinus pictus*: similar in size; longer f. a. humeralis. *Arborophila*

torqueola: very similar; better developed and longer impressio ligamenti acrocoracohumeralis (Table 37; Figure A4e).

Table 37. Measurements of coracoid omal of fossil and recent Phasianidae (Ref. to Figure A4e; b—width of distal acrocoracoidal part; c—thickness of diaphysis, measured distally of f. a. humeralis; d—width of diaphysis in the middle).

Species	a	b	c	d
Fossil—Dieu				
<i>Arborophila</i> sp. 1 NMNHS 12368	5.3	7.1	2.5	3.1
Recent				
<i>Polyplectron germaini</i> NHMT 1977.98.1	4.8	6.7	2.9	3.0
<i>Polyplectron bicalcaratum</i> UCBL	5.6	6.3	3.0	3.8
<i>Chrysolophus pictus</i> UCBL	5.3	7.5	3.4	3.6
<i>Chrysolophus pictus</i> UCBL	6.0	8.9	3.7	4.4
<i>Syrnaticus reevesii</i> UCBL	5.9	7.5	3.2	3.5
<i>Gallus gallus</i> UCBL 454/1	7.4	9.5	2.7	5.4
<i>Gallus gallus</i> UCBL 454/3	-	8.7	2.3	4.8
<i>Gallus gallus</i> UCBL 454/4	6.6	8.4	2.5	3.8
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	-	6.5	2.6	2.6
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	5.5	6.4	2.5	2.7
<i>Arborophila brunneopectus</i> NMNHW 491868	5.0	6.8	2.6	3.4
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	-	6.0	2.5	2.7
<i>Rollulus rouloul</i> NMNHW 490663	4.4	5.9	2.3	3.0
<i>Melanoperdix nigra</i> NMNHW 321114	4.4	6.4	2.3	2.9
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	-	8.2	3.5	4.4
<i>Perdix perdix</i> NHMT 1999.43.216	5.6	7.9	3.4	3.4
<i>Francolinus pictus</i> NHMT 1896.2.16.47	-	7.0	3.2	3.2
<i>Francolinus pintadineus</i> NMNHW 343198	-	7.0	3.0	3.3
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	-	6.5	2.4	2.7
<i>Alectoris graeca</i> NHMT 1868.9.12.13	-	8.8	3.6	3.0
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	-	6.4	2.5	2.7
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	-	3.2	1.0	ca. 1.8

Ulna dist. dex. NMNHS 12436 (Figure A13h) *Arborophila* sp.—1 (distinct from *Arborophila torqueola*). The finding is slightly damaged, but its features are sufficient to recognize its belonging to Galliformes, Phasianidae, and *Arborophila* spp. *Rollulus rouloul*, *Bambusicola thoracica*, and *Francolinus francolinus henrici*: relatively narrower distal ending and more straight distal half of the diaphysis. *Alectoris graeca*: much smaller. *Arborophila javanica*: smaller; deeper and better-outlined sulcus tendineus. *Arborophila torqueola*: slightly smaller and lesser condylus ventr. (Table 38; Figure A4f).

Table 38. Measurements of ulna dist. of fossil and recent *Perdicinae* (Ref. to Figure A4f).

Species	a	b	c
Fossil—Dieu			
<i>Arborophila</i> sp.—1 NMNHS 12436	ca. 4.2	4.8	4.1
Recent			
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	5.0	5.0	3.5
<i>Arborophila javanica</i> NHMT 1850.8.15.69	5.2	5.7	4.7
<i>Rollulus roulroul</i> NHMT 1893.4.28.3	4.5	5.3	4.4
<i>Rollulus roulroul</i> NHMT 1896.2.16.60	4.8	5.5	4.3
<i>Bambusicola thoracica</i> NHMT 1971.10.20.1	4.7	4.6	4.9
<i>Francolinus francolinus henrici</i> NHMT 1921.5.21.23	5.6	5.7	4.4
<i>Alectoris graeca</i> NHMT 1868.9.12.13	6.2	6.5	5.3

Arborophila sp.—2 (aff. *Arborophila torqueola*)

Tbt. prox. sin. sad. NMNHS 12462 (Figure A13i) *Arborophila* sp.—2: TL: 23.2. Dimensions determine this finding as *Perdicinae*. *Perdica*, *Calloperdix*, *Coturnix*, and *Synoicus* (incl. former *Excalfactoria*) are much smaller. *Alectoris graeca*: absence of a clear edge (linea intermuscularis) along the diaphysis below the crista cnemialis cranialis. *Bambusicola thoracica*: more medial, than lateral, position of crista cnemialis cranialis. *Francolinus pictus*: lesser ventro-caudal direction of the crista cnemialis cranialis. The morphological features (presence of a small pricklet on the medial side of the diaphysis at the level of the proximal end of crista fibularis) refers it to *Arborophila*. High similarity to *Arborophila torqueola* (Table 39; Figure A4g).

Table 39. Measurements of tbt. prox. of fossil and recent *Perdicinae* (Ref. to Figure A4g).

Species	a	b	c
Fossil—Dieu			
<i>Arborophila</i> sp.—1 NMNHS 12462	5.6	5.3	ca. 7.7
Recent			
<i>Arborophila javanica</i> NHMT 1850.8.15.69	5.5	5.5	ca. 7.3
<i>Arborophila brunneopectus</i> NMNHW 343998	4.6	4.7	ca. 7.5
<i>Arborophila brunneopectus</i> NMNHW 491868	6.6	6.3	8.9
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	4.0	4.7	6.5
<i>Perdica asiatica</i> NHMT 1868.9.12.8	2.7	2.7	4.1
<i>Alectoris graeca</i> NHMT 1909.11.18.67	4.8	5.5	8.5
<i>Calloperdix bicalcaratum</i> 1871.9.28.7	4.1	4.0	6.7
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	4.3	4.3	7.1
<i>Rollulus roulroul</i> NMNHW 490663	ca. 4.2	ca. 4.4	7.4
<i>Francolinus pictus</i> NHMT 1896.2.16.47	5.1	5.2	ca. 7.5
<i>Synoicus ypsilophorus australis</i> NHMT 1952.2.89	ca. 3.2	3.7	-
<i>Melanoperdix nigra</i> NMNHW 321114	3.7	ca. 3.9	7.0

Tbt. dist. sin. NMNHS 12335 (Figure A13j,k) *Arborophila* sp.—2. Dieu. TL: 16.8. Cranial part of condylus lateralis has been damaged. *Melanoperdix niger*: less developed epicondylus med. and more asymmetrical epiphysis. *Perdix perdix*, *Alectoris graeca*, *Francolinus pictus*, and *Rhizothera longirostris*: smaller. *Rollulus roulroul*: thicker diaphysis; deeper incisura

intercondylaris. *Synoicus ypsilophorus*: larger; thicker diaphysis. *Arborophila brunneopectus*: similar. *Arborophila javanica*: shallower relief on the medial surface of the epicondylus medialis. *Arborophila torqueola*: very similar; thicker diaphysis; certainly referred to *Arborophila*, but it could not be identified further (Table 29). Tmt prox. sin. NMNHS 12406 (Figure A13l,m) *Arborophila* sp.—2.TL: 7.5. A small splinter of the cranial surface of prox. epiphysis. Cranial part of the articular surface (cotyla lat. and cot. medial.), as well as impresiones retinaculi extensorii are preserved. The approximal width of prox. epiphysis: 7.0. This finding has been compared with specimens of the most common genus of Perdicinae in the examined fossil material, *Arborophila*. It shows considerable similarity to *Arborophila torqueola*, but its fragmentarity does not allow firm determination.

Arborophila sp.—3

Tbt. dist. dex. NMNHS 12317 (Figure A13n). *Arborophila* sp.—3. Dieu. TL: 11.0. All features of a small phasianid, i.e., of the Perdicinae subfamily. *Polyplectron germaini*: smaller size; less rounded condylus med. *Alectoris* and *Francolinus*: smaller size; less oval shape of condylus med. Both the morphologically and dimensionally is referred to *Arborophila*. The calcyte cover and bad preservation of the finding (p. stn. has been broken) do not allow further determination (Table 3). Humerus sin. NMNHS 12470 (Figure A13o) *Arborophila* sp.—3. *Rollulus rouloul*: rounder processus flexorius and the deeper fossa olecrani. *Melanoperdix niger*: larger and deeper fossa olecrani and more distally positioned line of latissimus dorsi anteriorcs. *Perdix perdix*: smaller; shorter tendineal facet on the medial side of diaphysis. *Polyplectron bicalcaratum*: shallower fossa musculus brachialis and not concave tendineal facet on the medial side of the diaphysis. *Bambusicola thoracica*: thinner diaphysis. *Alectoris graeca*: smaller and of deeper sulcus ligamenti transversus. *Alectoris barbara*: thicker distal ending. *Arborophila javanica*: blunt tip at tuberculum dorsale of crista deltopectoralis, thicker diaphysis (measurement “e”), and better developed epicondylus dorsalis. *Arborophila torqueola*: thicker diaphysis and less protruding epicondylus dorsalis (Table 40; Figure A4h).

Table 40. Measurements of humerus of fossil and recent Perdicinae (Ref. to Figure A4h).

Species	a	b	c	d	e	f
Fossil—Dieu						
<i>Arborophila</i> sp. NMNHS 12470	44.4	9.5	11.8	4.7	3.8	4.8
Recent						
<i>Arborophila javanica</i> NHMT 1850.8.15.69	47.4	10.1	12.8	5.0	3.8	5.0
<i>Arborophila brunneopectus</i> NMNHW 491868	46.0	10.2	12.9	5.0	3.7	5.3
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	42.2	18.9	11.4	4.3	3.3	4.8
<i>Arborophila brunneopectus brunneopectus</i> NMNHW 343998	44.8	9.6	11.9	4.4	3.3	4.9
<i>Francolinus pintadeanus</i> NMNHW 343198	51.8	10.0	12.6	4.5	3.5	5.5
<i>Alectoris graeca</i> NHMT 1909.11.18.67	49.6	10.3	13.9	4.8	3.8	5.3
<i>Perdix perdix</i> NHMT 1962.21.1	48.8	9.7	12.9	-	-	5.2
<i>Perdicula asiatica</i> NHMT 1868.9.12.8						
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	42.7	9.1	11.2	3.9	3.5	4.9
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	42.2	8.8	11.0	3.9	3.4	4.4
<i>Rollulus rouloul</i> NMNHW 490663	42.5	8.7	11.8	4.4	3.6	4.9
<i>Melanoperdix nigra</i> NMNHW 321114	43.8	9.5	11.6	4.5	3.6	4.8

Humerus dex. NMNHS 12472 (Figure A13p). *Arborophila* sp.—3. Dieu. TL: 28.0. Both epiphyses are missing, but almost the whole diaphysis is preserved. *Rollulus rouloul*:

thicker diaphysis (measurement “a”) and concavity around the line of latissimus dorsi anterioris. *Melanoperdix niger*: more curved diaphysis. *Perdix perdix*: more bended diaphysis. *Pucrasia asiatica*: much larger. *Gallus gallus*, *Alectoris graeca*, and *Rhizothera longirostris*: much smaller. *Polyplectron bicalcaratum* and *Bambusicola thoracica*: less developed margo caudalis. *Francolinus pictus*: straight, not bended, diaphysis in dorsal view. *Arborophila torqueola*: very similar; slightly smaller. *Arborophila brunneopectus*: similar in morphology and size, including the shape and the position of the socket (1); the measurement “b” is larger. *Alectoris barbara*: similar in size, but the distal part of the diaphysis is thicker. The finding could not be determined further (Table 41; Figure A4i).

Table 41. Measurements of humerus of fossil and recent *Perdicinae* (Ref. to Figure A4i; a—minimum width of diaphysis; b—minimum thickness of diaphysis).

Species	a	b
Fossil—Dieu		
<i>Arborophila</i> sp. NMNHS 12472	4.7	3.8
Recent		
<i>Arborophila javanica</i> NHMT 1850.8.15.69	5.0	3.8
<i>Arborophila brunneopectus</i> NMNHW 491868	4.7	3.4
<i>Arborophila brunneopectus</i> NMNHW 343998	4.5	3.4
<i>Rollulus rouloul</i> NMNHW 490663	4.3	3.4
<i>Melanoperdix nigra</i> NMNHW 321114	4.3	3.5
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	4.1	3.3
<i>Alectoris graeca</i> NHMT 1868.9.12.13	5.2	4.4
<i>Gallus gallus</i> NHMT 1868.2.19.59	7.2	6.0
<i>Bambusicola thoracica</i> NHMT 1871.10.20.1	4.2	3.4
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	6.6	5.1
<i>Perdix perdix</i> NHMT 1999.43.216	4.6	3.5
<i>Francolinus pintadeanus</i> NMNHW 343198	4.4	3.7
<i>Francolinus pictus</i> NHMT 1896.2.16.47	4.7	4.0
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	3.9	3.4
<i>Perdica asiatica</i> NHMT 1868.9.12.8	4.1	2.5

cf. *Arborophila* sp.

Femur dex. juv. NMNHS 12329 (Figure A13q) cf. *Arborophila* sp. Dieu. TL: 21.0. Only the medial part of the diaphysis is preserved. Linea intermuscularis caudalis and foramen nutritium are also preserved. These details show the height resemblance with g. *Arborophila*, but it is hardly to be identified further. Sternum NMNHS 12407 cf. *Arborophila* sp. Only the most cranial part of the carina sterni between the rostrum sterni and apex carinae is preserved. TL: 16.3. The morphology clearly indicated *Perdicinae*. *Arborophila*: cristae laterales is very similar. *Francolinus*, *Rhizothera*, *Alectoris*, *Perdix*, and *Lerwa* have wider (i.e., thicker) carina sterni at the compared place. *Rollulus*: cristae laterales is thicker. *Arborophila*: cristae laterales is very similar.

Bambusicola Gould, 1863 sp. (aff. *fytychii* Anderson, 1871) Mountain Bamboo Partridge

This is a resident of NE India, E Bangladesh, and SW China. It is a common resident in W, N, E Myanmar, NW Thailand, N Laos, and W Tonkin [7] (Supplementary Materials, Map 14). IUCN—LC. Scapula prox. dex., NMNHS 12420 (Figure A13r). Dieu. TL: 14.9. The acromion is broken. *Syrnaticus reevesii*: angular shape of f. a. humeralis. *Polyplectron bicalcartatum*: shallower lateral edge of f. a. humeralis. *Chrysolophus pictus*:

triangle-like, not square-like shape of f. a. humeralis. *Gallus gallus*: much smaller. The find can metrically referred to *Perdicinae*. *Rollulus rouloul*: longitudinal groove on the dorsal side (of margo dorsalis scapulae). *Arborophila brunneopectus*: inclined edge lateral edge of f. a. humeralis. *Melanoperdix niger*: much larger f. a. humeralis. *Bambusicola thoracica*: thicker corpus scapulae. *Perdix perdix*: smaller; thicker corpus scapulae; f. a. humeralis is not protruded. *Synoicus ypsilophorus*: thicker corpus scapulae. *Polyplectron bicalcaratum*, *Arborophila torqueola*, and *Rollulus rouloul*: thicker corpus scapulae. *Synoicus chinensis*, *Pucrasia asiatica*, and *Coturnix coturnix*: much larger. *Pucrasia macrolopha*: much smaller. *Rollulus rouloul*: slightly smaller; dorsal surface of corpus scapulae that is not concave. *Bambusicola thoracica*: very similar. *Bambusicola fytchii* is the only species spread in Vietnam. Unfortunately because of lacking of comparative material and the established similarity to *Bambusicola thoracica*, we refer the find to *Bambusicola* sp. (aff. *fytychii*) (Table 15).

Perdicinae Horsfield, 1821 gen. Partridges

Ulna dist. dex., N 12355 (Figure A13s,t) *Perdicinae* gen. (*Melanoperdix* and *Caloperdix*) Dieu. TL: 28.0. *Polyplectron bicalcaratum*: smaller tuber carpale; sharper condylus ventralis ulnaris. *Polyplectron germaini*: deeper sulcus radialis; blunter tuberculum carpale. *Gallus gallus*: smaller; less concave sulcus tendineus on condylus dorsalis. *Chrysolophus pictus*: deeper incisura tendinea. *Lerwa lerwa*: smaller; rounder condylus dorsalis. *Rhizothera longirostris*: smaller; without a constriction between condylus ventralis and tuberculum carpale. *Alectoris graeca* and *Perdix perdix*: shorter condylus ventralis; more gradual transition between the diaphysis and distal ending in a lateral view. *Perdix perdix*: shorter condylus ventralis in cranial view. *Arborophila torqueola* and *Arborophila brunneopectus*: the same way, rounder, not with a sharp transition, lateral view of condylus dorsalis and wider distal diaphysis. *Arborophila torqueola* and *Arborophila javanica*: bigger, more robust and labrum condyli rounder, than elongated in the lateral view. This feature clearly distinguishes the specimen from *Arborophila*. *Rollulus rouloul*: smaller; sharper condylus ventralis; smaller tuberculum carpale. *Melanoperdix niger*: rounder condylus dorsalis ulnaris; bigger measurement “b”. *Francolinus pictus*: relatively larger; more relief condylus dorsalis. *Perdicula asiatica*: larger; relatively smaller condylus ventralis. *Bambusicola thoracica*: larger; shorter, and blunter condylus ventralis. *Ammoperdix heyi*, *Coturnix japonica*, *Coturnix pectoralis* and *Coturnix coturnix*: much larger (Table 42; Figure A5a). No remaining uncomparing genera in the SE Asia, except *Caloperdix ocella*. We could not obtain comparative specimens of it, but as it seems from the other comparisons of the ulna [27] and the total body length [6] of that species, the Ferruginous Wood-Partridge is of approximatively the same size (a little bit smaller) as the *Arborophila brunneopectus*.

Table 42. Measurements of ulna dist. of fossil and recent Phasianidae (Ref. to Figure A5a).

Species	a	b	c	d
Fossil—Dieu				
Perdicinae gen. NMNHS 12355	5.6	4.2	5.3	3.0
Recent				
<i>Polyplectron germaini</i> NHMT 1977.98.1	6.2	3.7	6.1	4.7
<i>Polyplectron bicalcaratum</i> UCBL (no number)	6.3	3.8	6.0	3.2
<i>Chrysolophus pictus</i> UCBL 131/5	6.6	4.3	6.6	3.5
<i>Chrysolophus pictus</i> UCBL (no number)	6.1	4.0	6.2	3.6
<i>Gallus gallus</i> UCBL 454/1	7.8	5.8	7.7	4.0
<i>Gallus gallus</i> UCBL 454/3	7.5	5.6	7.5	3.5
<i>Gallus gallus</i> UCBL 454/4	5.5	4.7	5.7	3.4

Table 42. Cont.

Species	a	b	c	d
<i>Rollulus rouloul</i> NMNHW 490663	5.2	3.2	4.4	2.4
<i>Rollulus rouloul</i> NHMT 1973.66.63	5.0	3.2	3.2	3.4
<i>Melanoperdix nigra</i> NMNHW 321114	5.3	3.3	5.0	2.6
<i>Ammoperdix heyi</i> NHMT 1865.12.8.17	4.5	2.8	3.8	2.9
<i>Bambusicola thorquatica</i> NHMT 1871.10.20.1	4.8	3.1	5.0	3.2
<i>Rhizothera longirostris</i> NHMT 1851.11.10.41	7.1	4.5	6.7	4.6
<i>Arborophila javanica</i> NHMT 1850.8.15.69	5.9	3.3	5.1	3.6
<i>Arborophila brunneopectus</i> NMNHW 491868	5.8	3.4	5.8	3.6
<i>Arborophila brunneopectus</i> NMNHW 343998	5.3	3.2	4.9	2.4
<i>Arborophila torqueola</i> NHMT 1896.2.16.53	5.0	3.3	4.6	3.1
<i>Lerwa lerwa</i> NHMT 1933.11.16.31	6.7	4.2	7.2	4.6
<i>Perdix perdix</i> NHMT 1930.3.24.27	5.7	3.8	5.1	3.8
<i>Perdix perdix</i> NHMT 1961.21.1	6.1	3.8	5.2	3.7
<i>Francolinus pictus</i> NHMT 1896.2.16.47	5.3	3.5	5.0	3.7
<i>Francolinus pintadeanus</i> NMNHW 343 198	6.2	ca. 4.2	5.5	2.6
<i>Synoicus ypsilophorus</i> NHMT 1952.2.89	4.6	2.6	4.0	2.5
<i>Alectoris graeca</i> NHMT 1868.9.12.13	6.8	4.3	6.3	4.8
<i>Alectoris graeca</i> NHMT 1909.11.18.67	5.9	3.7	5.9	4.0
<i>Galloperdix bicalcaratum</i> NHMT 1871.9.28.7	5.3	3.1	5.2	3.3
<i>Perdicula asiatica</i> NHMT 1868.9.12.8	3.6	2.0	2.5	2.2

Cmc. prox. sin., NMNHS 12427 (Figure A13w,x) *Perdicinae* gen. (*Melanoperdix*, *Caloperdix*). Dieu. TL: 13.4. *Syrnaticus reevesii*: thinner and slender processus extensorius. *Polyplectron bicalcaratum*: sharp tip of pr. extensorius. *Chrysolophus pictus*: narrower tr. carpalis. *Gallus gallus*: caudal inclination of of the cranial edge of pr. intercarpalis. The smaller dimensions refers the fossil specimen to *Perdicinae*. *Perdix perdix*: more caudal position of pr. intermetacarpalis. *Bambusicola thoracica*, *Synoicus chinensis*, and *Coturnix coturnix*: considerably larger. *Alectoris graeca*: similar in size, but the pr. pisiformis is positioned more caudally. *Synoicus ypsilophorus*: considerably larger; round, not angular, section of os metacarpale majus. *Francolinus levaillantii*: narrower tr. carpalis. *Francolinus pictus*: wider pr. allularis. *Francolinus francolinus*: resembles in general morphology; more erected pr. extensorius; rounder ventral condylus of tr. carpalis. *Francolinus pintadeanus*: similar in the position of pr. intermetacarpalis; constricted condylus ventralis of tr. carpalis; os metacarpale minus at synostosis metacarpale prox. parallel to os metacarpale minus. On the other hand, this constriction is typical for the *Arborophila* species, but the NMNHS 12427 differs from *Arborophila* by the concave f. a. ulnocarpalis. *Arborophila brunneopectus* and *Arborophila torqueola* and *Arborophila javanica*: much more distally positioned pr. intermetacarpalis and shallower; more cranially positioned pr. pisiformis; sharper pr. alularis; os metacarpale minus at synostosis metacarpale prox. parallel to os metacarpale minus. The find remained uncomparated with the remaining species of *Arborophila* (*A. rufogularis*, *A. davidi*, *A. chloropus*, and *A. merlinii*), and *Tropicoperdix charltonii*, currently spread throughout Vietnam, and *Melanoperdix nigra* and *Caloperdix ocella*. Both are of the same size as N 12427 (Table 6). Humerus prox. dex., NMNHS 12442 (Figure A13v) *Perdicinae* gen. Dieu. TL: 16.2. The find represents the proximal half of diaphysis without a proximal ending. Part of the f. caudalis is also missing. Minimum width of diaphysis: 4,7. The finding shows the typical shape of the humeri of small *Perdicinae* and could not be further identified.

Ulna dex., NMNHS 12529 (Figure A13u) *Perdicinae* gen. A very small fragment of the second proximal fourth of diaphysis. The finding shows the characteristic bending and the more or less triangle section. Measurements: TL: 9.6; maximum diameter: 3.1. Because of immaturity and bad preservation, it could not be further identified.

Phasianidae Horsfield, 1821 gen. Pheasants

Phalanx 1 dig. II pedis dex., NMNHS 12435 (Figure A14b) Phasianidae gen. Dieu. The finding shows typical features of the pedal phalanx of Phasianidae. *Lophura ignita*: smaller and slender; less bended (Table 43). Because of the wide diversity of large phasianids in the region, the finding cannot be further determined.

Table 43. Measurements of phalanx 1 dig. II pedis of fossil and recent Phasianidae (a—height of f. a. prox.; b—width of f. a. dist.; c—TL.).

Species	a	b	c
Fossil—Dieu			
Phasianidae gen. NMNHS 12409	2.6	2.5	14.3
Phasianidae gen. NMNHS 12435	4.5	3.9	15.9
Recent			
<i>Lophura ignita</i> NHMT 1869.9.12.24	6.7	5.4	19.0
<i>Phasianus colchicus</i> NMNHS 11/1987	6.4	5.8	19.3
<i>Phasianus colchicus</i> NMNHS 60/2016	6.7	6.1	18.2

Phalanx 1 dig. II pedis dex. NMNHS 12409 (Figure A14c) Phasianidae gen. Dieu. The finding shows typical features of the pedal phalanx of Phasianidae. *Lophura ignita*: smaller and slender (Table 43). Because of the wide diversity of large phasianids in the region, the finding cannot be further determined. Phalanx 2 dig. II pedis sin. NMNHS 12450 (Figure A14d) Phasianidae gen. Dieu. The find shows the typical features of pedal phalanx of Phasianidae (Table 44; Figure A5b). *Phasianus colchicus*: more gracile.

Table 44. Measurements of phalanx 2 dig. II pedis of fossil and recent Phasianidae (Ref. to Figure A5b); d—minimal thickness of the phalangeal diaphysis).

Species	a	b	c	d
Fossil—Dieu				
Phasianidae gen. NMNHS 12450	12.4	4.1	2.5	2.3
Recent				
<i>Lophura ignita</i> NHMT 1869.9.12.24	10.9	4.9	3.2	2.7
<i>Crossoptilon auritum</i> UCBL	14.0	4.7	2.8	2.7
<i>Lophura nycthemera</i> UCBL	13.1	3.5	2.1	2.0
<i>Lophura diardi</i> UCBL	13.2	4.1	2.6	2.5
<i>Syrmaticus reevesii</i> UCBL	12.6	3.2	1.9	1.9
<i>Polyplectron bicalcaratum</i> UCBL	12.8	3.0	1.7	1.5
<i>Lophophorus impejanus</i> UCBL	16.5	4.9	3.0	2.8
<i>Chrysolophus pictus</i> UCBL	12.3	3.0	1.9	1.6
<i>Gallus gallus</i> UCBL 454/1	12.1	3.6	2.4	2.1
<i>Gallus gallus</i> UCBL 454/3	11.7	3.7	2.6	2.0

Tbt. sin. NMNHS 12509 (Figure A14e) Phasianidae gen. TL: 26.1. Maximum diameter of diaphysis: 6.9. The find represents a bone splinter of diaphysis edges of sulcus exten-

sorius that are completely preserved; nevertheless, only the third fourth of the diaphysis is preserved. *Lophura diardi* and *Tragopan temminckii*: rounder, not elliptic, section; wider sulcus extensorius. Bad preservation of the bone does not allow further identification (Table 45; Figure A5c).

Table 45. Measurements of tbt. of fossil and recent Phasianidae (Ref. to Figure A5c).

Species	a	b
Fossil—Dieu		
Phasianidae gen. NMNHS 12509	6.7	6.2
Recent		
<i>Lophura diardi</i> UCBL	6.8	5.4
<i>Lophura diardi</i> NHMT 1976.32.3	5.9	4.4
<i>Tragopan temminckii</i> MBNH 1976.1.1	6.7	6.2

Phalanx 3 dig. II pedis dex. NMNHS 12361 (Figure A14a) Phasianidae gen. Dieu. TL: 9.8. (Table 46; Figure A5d). The distal fourth of the bone is broken and missing. The finding shows the typical features of the pedal phalanx of Phasianidae. *Crossoptilon aurtum*: more symmetrical f. a. prox. *Lophura ignita*: smaller and slender; less bent. Because of the fragmentarity and the large diversity of large phasianids in the region, the find could not further be determined.

Table 46. Measurements of phalanx 3 dig. II pedis of fossil and recent Phasianidae (Ref. to Figure A5d).

Species	a	b	c
Fossil—Dieu			
Phasianidae gen. NMNHS 12361	2.0	3.6	3.5
Recent			
<i>Lophura ignita</i> NHMT 1869.9.12.24	2.4	3.2	4.3
<i>Crossoptilon aurtum</i> UCBL	2.4	4.7	3.7
<i>Lophura diardi</i> UCBL	2.5	4.1	4.6
<i>Syrmaticus reevesii</i> UCBL	1.8	3.2	3.0
<i>Polyplectron bicalcaratum</i> UCBL	1.5	3.0	2.4
<i>Lophophorus impejanus</i> UCBL	2.8	4.9	5.0

3.2. Columbiformes Latham, 1890 Pigeons and Doves

3.2.1. Columbidae Leach, 1820 Pigeons and Doves

Ducula badia (Raffles, 1822) Mountain Imperial Pigeon

This is a resident of Nepal, Bhutan, NE, SW India, SW, S China, and Greater Sundas. It is a fairly common to common resident in SW, W, N, C, E (east) Myanmar, Tenasserim, W, NW, NE, SE, extreme S Thailand, Peninsular Malaysia, and Indochina (except Cochinchina) [7] (Supplementary Materials, Map 15). IUCN—LC. Humerus dex., NMNHS 12518 (Figure A14f) *Ducula badia*. Dieu. TL: 57.3. A large columbid. *Columba hodgsoni*: larger *Columba palumbus*: bigger; longer diaphysis; more distal position of the tuberculum supracondylare dorsale; longer sulcus ligamenti transversus (i.e., does not belong to g. *Columba*). *Treron curvirostra*, *Treron calva*, *Treron bicincta*, *Treron vernans*, and *Treron naalia*: much larger (five of the remaining seven species of g. *Treron* in the whole SE-Asian region have a slightly larger size than the compared ones. These are: *T. seiboldii*, *T. apicauda*, *T. sphenura*, *T. capellei*, and *T. phoenicoptera* [6]. However, as these authors note, none of them exceeds the body size of the Rock Pigeon (*Columba livia*, L., 1758). Three species of g. *Ducula* have a much larger size: *D. aenea*, *D. bicolor*, and *D. badia*).

Hence, all of the considerably smaller species could be excluded from our comparison. *Ducula forsteini*: relatively thinner diaphysis. *Ducula bicolor*: slightly larger; shallower fossa musculus brachialis. *Ducula aenea*: better developed pr. supracondylaris dorsalis; wider intumescencia. *Ducula spilorrhoa*: wider intumescencia; less flattened diaphysis in its distal end. *Ducula badia*: complete morphological identity (Table 47; Figure A5e).

Table 47. Measurements of humerus of fossil and recent Columbidae (Ref. to Figure A5e).

Species	a	b	c
Fossil—Dieu			
<i>Ducula badia</i> NMNHS 12518	6.7	5.7	ca. 58.0
Recent			
<i>Ducula badia</i> NHMT 1975.105.9	6.1	4.9	55.5
<i>Ducula badia</i> NHMT 1969.1.4	5.8	5.4	54.5
<i>Ducula badia</i> NHMT 1969.1.3	5.9	4.6	51.2
<i>Ducula badia griseicapilla</i> NMNHW 344529	6.3	4.8	55.8
<i>Ducula aenea</i> NHMT 1960.3.1.	5.9	5.1	55.2
<i>Ducula aenea</i> NHMT 1850.8.15.49	5.7	4.9	57.5
<i>Ducula forsteini</i> NHMT 1871.9.13.2	6.0	5.1	52.7
<i>Ducula bicolor</i> NHMT 1952.2.390	5.6	4.6	52.4
<i>Ducula spilorrhoa</i> NHMT 1969.4.12	5.6	5.0	56.8
<i>Treron curvirostra</i> NHMT 1969.1.2	3.7	3.0	33.0
<i>Treron vernans</i> NHMT 1850.8.15.77	3.8	3.2	33.2
<i>Treron calva</i> NHMT 1891.7.20.42	4.0	3.2	37.0
<i>Treron bicincta</i> NHMT 1864.6.27.6	3.6	3.1	32.9
<i>Treron naalia</i> NHMT 2000.11.5	4.6	3.9	42.2
<i>Columba palumbus</i> UCBL 239/1	6.2	4.6	54.4
<i>Columba palumbus</i> UCBL 239/2	6.7	5.2	54.5
<i>Columba livia</i> NHMT 1930.3.24.40	5.2	3.9	45.4
<i>Columba hodgsoni</i> NMNHW 318234	4.4	5.3	47.0

Cmc prox. sin., NMNHS 12342 (Figure A14g) *Ducula badia*. TL: 20.0. *Chalcophaps indica*, *Macropygia unchall*, and *Macropygia ruficeps*: much larger. *Treron pompadora aromatica* and *Treron curvirostra*: larger. *Treron fulvicollis*: much larger. *Treron bicincta*: larger; better edged pr. alularis. *Treron waalia*: presence of a clearly developed incisura on the caudal edge of the symphysis metacarpalis prox. *Treron calva*: larger; larger inception of pr. intermetacarpalis. *Ducula aenea*: slightly smaller; two times narrower developed incisura on the caudal edge of the symphysis metacarpalis prox. *Ducula latrans*: slender os metacarpalis majus. *Ducula whartoni*: deeper fovea carpalis caudalis; slightly smaller. *Ducula bicolor*: similar, but sulcus tendineus is less parallel to the longitudinal axis of os met. majus. *Ducula badia*: complete similarity (Table 48; Figure A5f).

3.2.2. cf. Columbidae gen. Pigeon/Dove

Tmt dist. sin., NMNHS 12341 (Figure A14h,i). cf. Columbidae gen. TL: 35.4. Tr. metatarsi 4 is not preserved. Morphology most resembles some columbids. It is closest to *Caloenas nicobarica* and even to *Goura cristata*. Its relatively larger size excludes almost all of the present-day species of Columbidae spread throughout Vietnam. *Caloenas nicobarica*: similar; slender in prox. half and more straight diaphysis. *Goura cristata*: much smaller (Table 49; Figure A5g).

Table 48. Measurements of cmc prox. of fossil and recent Columbidae (Ref. to Figure A5f).

Species	a	b	c	d
Fossil—Dieu				
<i>Ducula badia</i> NMNHS 12342	4.2	4.0	2.4	5.8
Recent				
<i>Ducula badia</i> NHMT 1969. 1.4	5.3	5.0	2.9	6.7
<i>Ducula badia</i> NHMT 1969.1.3	5.1	4.7	2.7	6.7
<i>Ducula badia</i> NHMT 1975.105.9	5.2	4.8	2.9	6.4
<i>Ducula aenea</i> NHMT 1960.3.1	5.3	4.8	2.9	6.8
<i>Ducula aenea</i> NHMT 1864.12.20.25	-	4.6	2.7	-
<i>Ducula aenea</i> NHMT 1868. 9.12.28	5.2	5.1	3.0	7.1
<i>Ducula bicolor</i> NHMT 1952.2.390	4.7	4.3	2.7	6.2
<i>Ducula bicolor</i> NHMT 1851.5.10.1	4.8	4.7	2.7	6.4
<i>Ducula latrans</i> NHMT 1975.3.4	4.8	4.2	2.4	6.6
<i>Ducula latrans</i> NHMT 1975.3.2	5.2	4.8	2.8	6.1
<i>Ducula whartoni</i> NHMT 1898.9.16.74	4.8	5.0	2.5	6.0
<i>Ducula whartoni</i> NHMT 1898.9.16.78	5.5	2.8	2.7	6.9
<i>Treron pompadora aromatica</i> BNMNH 1850.8.15.60	ca. 3.2	4.0	2.0	-
<i>Treron curvirostra</i> NHMT 1969.1.2	3.3	3.2	1.8	4.3
<i>Treron fulvicollis</i> NHMT 1850.8.15.142	-	2.9	1.6	-
<i>Treron bicincta</i> NHMT 1864.6.27.6	3.4	3.8	1.9	4.6
<i>Treron waalia</i> NHMT 2000.11.5	4.8	4.7	2.6	6.0
<i>Treron calva</i> NHMT 1891.7.20.42	3.4	3.6	2.1	4.8
<i>Macropygia unchall</i> NHMT 1871.7.21.9	3.4	ca. 3.4	2.1	4.7
<i>Macropygia ruficeps</i> NHMT 1969.1.6	2.8	3.1	1.8	3.1
<i>Chalcophaps indica</i> NHMT 1903. 7.27.2	-	3.0	1.7	-

Table 49. Measurements of tmt dist. of fossil and recent Columbidae (Ref. to Figure A5g).

Species	a	b	c
Fossil—Dieu			
cf. Columbidae gen. NMNHS 12341	ca. 4.0	ca. 4.0	4.2
Recent			
<i>Caloenas nicobarica</i> NHMT 1985.26.2	3.6	4.1	3.4
<i>Caloenas nicobarica</i> NHMT 1890.11.3.11	3.4	ca. 3.9	4.6
<i>Goura cristata</i> NHMT 1966.52.60	5.8	6.4	6.1

3.3. Pelecaniformes Sharpe, 1891

Ardeidae Leach, 1820

Ulna sin., NMNHS 12443 cf. Ardeini gen. (*Ardea* sp.). This finding represents a diaphysal fragment. TL 34.9, maximum diameter—8.4. The transversal section and profile of the bend indicate a fragment of the middle part of the diaphysis of the left ulna of a large bird. The diameter and curving fits to larger herons of *Ardea*, but the fragmentarity does not allow for further identification. It dimensionally corresponds to *Ardea cinerea* Linnaeus, 1758 and *Ardea alba* Linnaeus, 1758.

3.4. Strigiformes Wagler, 1830

3.4.1. Tytonidae Ridgway, 1914

aff. *Phodilus badius* (Horsfield, 1821) Oriental Bay Owl

This is a resident of NE, SW, India, Sri Lanka, SW, S China, Greater Sundas, and the Philippines (Samar); formerly Nepal, it is an uncommon resident (except W, C Myanmar, C Thailand, Singapore, W Tonkin, C, and S Annam). It was formerly recorded in Singapore [7] (Supplementary Materials, Map 16). IUCN—LC. Humerus dist. sin., NMNHS 12404 (Figure A14j) aff. *Phodilus badius*. Dieu. TL: 17.3. The deeper fossa musculus brachialis is the most peculiar feature of this finding [28], in his dissertation thesis, shows that the fossa brachialis is the only diagnostic morphological difference of the humeral bone in *Tyto*, *Phodilus*, and Strigidae. According to him, *Tyto* and *Phodilus* have a “deep brachial depression”, while Strigidae have a “shallow, indistinct brachial depression”. Our comparisons after this author refer NMNHS 12404 to Tytonidae (incl. Phodilinae). *Strix* and *Asio*: wider and shorter fossa brachialis; slightly curved pr. supracondylaris; ventral edge of fossa brachialis situated more dorsally (i.e., medially of the bone); clearly developed edge (1) above the condylus dorsalis; index “length: width” of fossa brachialis: 8:3.3, while in *Strix*: 8:3.8 and *Asio*: 8.6:2.2. *Ninox scutulata*: larger; deep fossa musculus brachialis, clearly edged in its proximal end. *Athene*, *Glaucidium*, *Otus*: larger. *Bubo*, *Ketupa*, and *Strix*: smaller. *Tyto novaehollandiae*, *Tyto capensis*, and *Tyto alba*: smaller; condylus dorsalis directed more transversally than longitudinally; smaller epicondylus dorsalis. The only owl in Tytonidae of slightly smaller size in the whole SE-Asian region is the Oriental Bay Owl (*Phodilus badius*). Its body length is about 27 cm, against 34 cm in *Tyto alba* and 35 cm in *Tyto capensis* [26] (Table 50; Figure A5h).

Table 50. Measurements of os humerus dist. of fossil and recent Strigiformes (Ref. to Figure A5h).

Species	a	b	c
Fossil—Dieu			
aff. <i>Phodilus badius</i> NMNHS 12404	11.7	5.8	3.3
Recent			
<i>Ninox scutulata</i> NHMT 1850.8.15.58	10.0	5.0	3.1
<i>Ninox philippensis centralis</i> NHMT 1966.48.1	9.3	4.3	2.7
<i>Tyto alba</i> NHMT 1955.5.36	16.4	8.3	4.6
<i>Tyto alba pratincola</i> NHMT 2002.9.2	15.0	7.9	4.0
<i>Tyto capensis</i> NHMT 1866.7.8.11	13.7	7.0	3.4
<i>Tyto novaehollandiae</i> NHMT 1954.30.84	17.0	8.5	4.5
<i>Strix seloputo</i> NHMT 1869.10.19.30	21.6	10.0	5.2
<i>Strix leptogrammica</i> NHMT 1973.66.133	17.4	ca. 8.0	4.8

3.4.2. Strigidae Leach, 1820

Surnia ulula Duméril, 1805 Northern Hawk Owl. This is a species of North-Holarctic distribution and it is not spread in SE Asia (ROBSON 2000) (Supplementary Materials, Map 17). IUCN—LC. Tmt. prox. sin., NMNHS 12382 *Surnia ulula*. Dieu (Figure A14k). TL: 17.7. This finding shows typical features for owls' tmt. *Asio otus*: cotyla med. oval, not round in dorsal view; cotyla lat. directed more laterally. *Asio flammeus*: crista med. hypotarsi more medially positioned; cotyla lat. directed more laterally. *Tyto alba*: latero-caudally, not caudally, directed cotyla lat.; shorter prox. epiphysis. *Strix uralensis*: much smaller; not straight, bent cranially, diaphysis. *Strix aluco*: smaller; not straight, bent cranially, diaphysis. *Athene noctua*: larger; much robust. *Bubo* and *Ketupa*: much smaller (not measured). Two Plio-Pleistocene species of the g. *Surnia* Dumeril, 1806 have been described—*Sumia capeki* Janossy, 1972, and *Sumia robusta* Janossy, 1977 from Czechia and

Hungary, respectively. After [29], the tmt of *S. capeki* is wider than those of the recent *S. ulula*. The specimen NMNHS 12382 completely fits in the metric range of *S. ulula*. *S. robusta* was “27% larger than the largest plusvariant of the recent form”, although “the morphological resemblance of the tarsometatarsus of the new species and of *Surnia ulula* is in all details very close” [30]. Thus, the compared specimen of N Vietnam could not be referred to these fossil taxa. *Surnia ulula*: complete similarity, both in morphology and sizes (Table 51; Figure A6a).

Table 51. Measurements of tmt prox. of fossil and recent Falconiformes (Ref. to Figure A6a).

Species	a	b	c
Fossil—Dieu			
<i>Surnia ulula</i> NMNH 12382	9.1	5.1	ca. 5.5
Recent			
<i>Surnia ulula</i> NHMT 1899.11.4.1	9.5	5.0	5.9
<i>Surnia ulula</i> NHMT 1872.10.25.3	10.0	5.9	6.3
<i>Surnia ulula</i> NHMT 1868.12.224.33	9.2	6.3	8.1
<i>Surnia ulula</i> NHMT 1855.4.4.7	9.4	6.2	6.2
<i>Surnia ulula</i> NHMT 1898.5.7.18	9.9	5.9	6.4
<i>Surnia ulula</i> NHMT 1898.5.7.17	9.6	6.2	5.7
<i>Asio otus</i> NHMT 1930.3.24.329	8.4	5.1	5.7
<i>Asio flammeus</i> NHMT 1930.3.24.329	9.0	5.7	6.5
<i>Tyto alba</i> NHMT 1975.39.1	9.8	5.8	6.5
<i>Strix uralensis</i> NHMT 1894.8.5.2	6.7	8.4	8.2
<i>Athene noctua</i> NHMT 1993.12.1	6.4	4.1	4.7
<i>Strix aluco</i> NHMT 1985.103.1	10.0	6.6	7.0

3.5. Accipitriformes Vieillot, 1816

3.5.1. Accipitridae Vieillot, 1816

Nisaetus cirrhatus (Gmelin, 1783) Changeable Hawk-Eagle

This is a resident of India (except NW), Nepal, Bangladesh, Sri Lanka, Andaman and Nicobar Is, Grater Sundas, and the Philippines. It is an uncommon to fairly common resident (except Thailand, W, E Tonkin, and N, C Annam) [7] (Supplementary Materials, Map 18). IUCN—LC. Femur dist. dex., NMNHS 12380 (Figure A14l,m) *Nisaetus cirrhatus*. Dieu. TL: 25.1. Both dimensions and morphology suggest an eagle (Aquilinae). *Hieraetus fasciatus*: deeper fossa poplitea, shorter epicondylus med.; more symmetrical sulcus intercondylaris. *Buteo rufinus*: rounder, not angular condylus med.; deeper fossa poplitea. *Circetus gallicus*: larger; less developed impressio ligamenti cruciati cranialis; more upright condylus lateralis. *Aquila clanga*: larger size; shorter and blunter epicondylus lateralis; less developed impressio ligamenti cruciati cranialis. *Accipiter gentilis*: much smaller. *Ictinaetus malayensis*: larger; deeper fossa poplitea. *Aquila nipalensis*: rounder condylus med. in the medial view. *Aquila clanga*: similar in size and general features; the condylus lateralis is less rounded in a lateral view; the condylus med. more rounded in medial view. *Aquila pomarina*: slightly smaller; lesser epicondylus medialis. This finding definitely refers to g. *Nisaetus*. This genus is represented by four species in the SE-Asian region [6]: *Nisaetus cirrhatus*, *Nisaetus nipalensis*, *Nisaetus alboniger*, and *Nisaetus nanus*. *N. nipalensis*: a similar, but distal end of the linea intermuscularis meets the base of the condylus medialis more caudally instead of medially. *Spizaetus ornatus*: similar; symmetrical sulcus intercondylaris in ventral view; smaller and less rounded condylus medialis in med. view. *Nisaetus cirrhatus*: very similar (Table 52; Figure A6b).

Table 52. Measurements of femur dist. of fossil and recent Aquilinae (Ref. to Figure A6b).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Nisaetus cirrhatus</i> NMNHS 12380	13.3	13.7	8.7	19.2	15.4
Recent					
<i>Spizaetus nipalensis</i> NHMT 2002.44.1	13.4	13.7	8.6	22.5	16.9
<i>Nisaetus cirrhatus</i> NHMT 2002.45.1	12.7	12.8	8.4	19.6	15.6
<i>Nisaetus cirrhatus</i> NHMT 1850.8.15.13	11.8	12.4	8.5	19.0	15.1
<i>Spizaetus ornatus</i> NHMT 1952.1.177	11.8	12.6	7.2	19.4	14.2
<i>Ictinaetus malayensis</i> NHMT 1969.1.1	10.8	11.2	6.3	17.4	11.2
<i>Hieraetus fasciatus</i> UCBL 91/1	15.2	15.5	9.9	24.0	17.6
<i>Hieraetus fasciatus</i> NHMT 1952.1.180	14.1	14.5	9.2	22.1	16.9
<i>Circaetus gallicus</i> UCBL 108/1	12.8	10.0	7.8	22.7	15.0
<i>Aquila clanga</i> UCBL 89/1	12.5	13.2	7.8	20.0	15.3
<i>Accipiter gentilis</i> NHMT 1976.60.2	9.8	10.4	5.9	16.1	11.3
<i>Buteo rufinus</i> NHMT 1856.7.20.3	11.5	13.8	7.8	19.7	15.2
<i>Aquila nipalensis</i> NHMT 1980.11.4	12.8	14.3	8.2	22.8	17.8
<i>Aquila clanga</i> NHMT 1952.3.205	11.9	14.9	8.2	19.8	15.2
<i>Aquila clanga</i> NHMT 1952.1.181	12.8	14.6	9.8	22.3	16.2
<i>Clanga pomarina</i> NHMT 1995.22.1	11.8	12.2	7.0	19.4	19.1
<i>Clanga pomarina</i> NHMT 1995.23.1	10.7	12.1	6.9	18.3	13.7

Phalanx 1 dig. I pedis sin., NMNHS 12381 (Figure A14n) aff. *Nisaetus* cf. *cirrhatus*. *Aegypius monachus*, *Aquila chrysaetos*, and *Haliaeetus leucogaster*: smaller. Both species also do not have such a fossa. The F. a. proximalis of *Pandion haliaetus* is convex, not concave. *Neophron percnopterus*: higher arc of f. a. prox. And less developed grooves on the facies ventralis. *Hieraetus fasciatus*: presence of a small fossa on the f. a. *Circaetus gallicus* has a short and thick phalanx *Haliaeetus indus*, *Accipiter* spp., *Circus* spp., and *Milvus* spp., which is considerably smaller. *Buteo buteo*: larger size and higher f. a. (measurement “a”). *Ictinaetus malayensis*: shallower relief of f. a. and its sharper contour of the medial end. *Pernis ptilorhynchus*: much larger size. *Spilornis cheela*: more prominent arc of the dorsal edge of f. a. At present, the only eagle of the whole SE-Asian region of similar size is *Nisaetus nipalensis*—a widespread, but uncommon species [7]. *Nisaetus nipalensis*: smaller and less convex f. a. prox. *Spizaetus ornatus*: slightly smaller and less convex f. a. prox. *Nisaetus cirrhatus*: almost complete identity (Table 53; Figure A6c).

Table 53. Measurements of phalanx 1 dig. I pedis of fossil and recent Accipitridae (Ref. to Figure A6c).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Nisaetus</i> cf. <i>cirrhatus</i> NMNHS 12381	7.0	11.3	6.5	ca. 7.0	ca. 27.0
Recent					
<i>Nisaetus cirrhatus</i> NHMT 2002.45.1	7.0	12.0	6.7	7.8	29.2
<i>Nisaetus ornatus</i> NHMTS 1952.1.177	7.4	12.4	6.7	7.5	34.2
<i>Spizaetus nipalensis</i> NHMT 2002.44.1	7.6	14.9	7.7	9.9	33.7
<i>Aegypius monachus</i> UCBL 84/1	9.4	18.4	9.4	ca. 11.0	32.4

Table 53. Cont.

Species	a	b	c	d	e
<i>Neophron percnopterus</i> UCBL 82/1	7.1	13.0	5.5	ca. 7.0	25.0
<i>Haliaeetus leucogaster</i> NHMT 1856.9.28.1	8.9	16.3	7.5	ca. 9.8	35.4
<i>Hieraetus fasciatus</i> UCBL 91/1	7.9	14.0	6.2	ca. 9.4	36.2
<i>Aquila chrysaetos</i> UCBL 86/5	10.5	18.2	13.8	ca. 11.6	40.1
<i>Haliastur indus</i> NHMT 1866.8.7.10	3.8	7.5	3.2	-	ca. 17.0
<i>Pandion haliaetus</i> UCBL 109/2	5.2	10.4	5.4	ca. 7.7	24.6
<i>Buteo buteo</i> NHMT 1998.14.1	5.1	10.0	5.2	ca. 5.8	19.5
<i>Ictinaetus malayensis</i> NHMT 1969.1.1	6.6	10.2	5.5	ca. 7.0	25.9
<i>Pernis ptylorhynchus</i> NHMT 1845.1.12.19	4.3	6.6	3.3	ca. 4.3	9.8
<i>Spilornis cheela</i> NHMT 1954.30.66	5.5	12.6	6.1	ca. 7.9	27.7
<i>Spilornis cheela</i> NHMT 1954.30.65	-	11.4	5.6	-	ca. 19.6
<i>Spilornis cheela</i> NHMT 1881.1.17.58	-	-	5.2	ca. 6.9	ca. 21.0
<i>Circus gallicus</i> UCBL 108/1	5.7	9.8	5.1	ca. 6.7	19.8

Butastur indicus (Gmelin, 1788) Grey-Faced Buzzard

This breeds in SE Siberia, Ussuriland, NE China, N, S Korea, and Japan; it winters in the Greater Sundas, Philippines, Sulawesi, N Moluccas, and rarely in New Guinea (W Papuan Is). It is an uncommon to common winter visitor in Tanasserim, W, NW, NE, S Thailand, Peninsular Malaysia, Singapore (rare), Cambodia, S Laos, C, S Annam, and Cochinchina. It is a fairly common to common passage migrant Tenasserim, Thailand, Peninsular Malaysia, Singapore, Cambodia, N, C Laos, E Tonkin, and N Annam [7] (Supplementary Materials, Map 19). IUCN—LC. Humerus dist., sin., NMNHS 12434 (Figure A14o) *Butastur indicus*. Dieu. TL: 19.9. Processus flexorius is broken. It is an accipitrid of medium size. *Buteo buteo* and *Milvus migrans*: metrically and more protruded tip. *Pernis apivorus*: smaller dimensions and smaller vertical inclination of condylus dorsalis. *Pernis ptylorhynchus*, *Spilornis cheela*, and *Accipiter gentilis*: smaller size. *Circus cyaneus*: shorter base of pr. Supracondylaris dorsalis and the rounder condylus dorsalis. *Circus aeruginosus* is considerably larger. *Haliastur indus*: more lateral position of sulcus m. scapulotricipitalis abd: smaller size. Both dimensionally and morphologically close to *Butastur indicus* (Table 54; Figure A6d).

Table 54. Measurements of humerus dist. Of fossil and recent Accipitridae (Ref. to Figure A6d).

Species	a	b	c	d
Fossil—Dieu				
<i>Butastur indicus</i> NMNHS 12434	ca. 9.0	6.2	7.4	4.0
Recent				
<i>Butastur indicus</i> NHMT 1871.7.21.7	9.2	6.3	7.2	4.1
<i>Circus cyaneus</i> UCBL 105/1	ca. 9.2	6.6	7.8	4.0
<i>Circus cyaneus</i> UCBL 105/2	ca. 8.0	5.8	7.2	-
<i>Circus cyaneus</i> UCBL 105/3	ca. 9.0	6.1	7.6	3.8
<i>Circus aeruginosus</i> 1952.2.70	13.5	8.0	9.9	5.3
<i>Haliastur indus</i> NHMT 1850.8.15.7	ca. 12.7	8.5	9.9	5.4
<i>Haliastur indus</i> NHMT 1866.8.7.10	ca. 13.8	10.1	8.6	5.0

Table 54. Cont.

Species	a	b	c	d
<i>Butastur indicus</i> NHMT 1881.1.17.58	ca. 13.0	11.0	10.0	5.8
<i>Accipiter gentilis</i> NHMT 1996.46.1	ca. 13.0	7.9	10.2	5.0
<i>Buteo buteo</i> UCBL 93/1	ca.12.3	8.4	9.2	5.0
<i>Buteo buteo</i> UCBL 93/4	ca.11.5	8.0	8.9	4.7
<i>Pernis apivorus</i> UCBL 103/1	ca.13.5	8.7	10.9	6.0
<i>Pernis apivorus</i> UCBL 103/3	ca.12.7	9.1	10.0	5.8
<i>Pernis ptylorhynchus</i> NHMT 1845.1.12.19	ca. 12.5	10.7	9.4	5.4
<i>Milvus migrans</i> UCBL 100/1	ca.13.2	8.8	9.6	5.7

Butastur cf. liventer (Temminck, 1827) Rufous-Winged Buzzard

This is a resident of SW China (SW Yunan), Java, and Sulawesi. It is a scarce to uncommon resident of Myanmar (but not only Tenasserim), W, NW, NE Thailand, Cambodia, C, S Laos, S Annam, and Cochinchina [7] (Supplementary Materials, Map 20). IUCN—LC. Humerus prox. dex., NMNHS 12352 (Figure A14t,u) *Butastur cf. liventer*. Dieu. TL: 27.8. The tuberculum ventrale and part of crista pectoralis of the proximal epiphysis are broken. The preserved morphological elements refer the finding to the smaller species of Accipitridae. *Accipiter trivirgatus*: much bigger. *Accipiter gentilis*: smaller; thinner (more flattened) caput humeri (measurement “b”). *Accipiter nisus*: more flattened caput humeri. *Accipiter soloensis*: much larger. *Accipiter badius*: larger. *Ictinaetus malayensis*: much smaller; similar to the proportions of caput humeri. *Haliastur indus*: slightly smaller; shorter crista pectoralis. *Milvus migrans*: shorter crista pectoralis. *Pernis ptylorhynchus*: much smaller. *Circus aeruginosus*: smaller. *Butastur teesa* and *Butastur indicus*: similar, except shorter crista pectoralis. *Nisaetus cirrhatus*: much smaller. *Buteo rufinus*: much larger. *B. buteo*: smaller; shorter crista pectoralis. *Butastur teesa*: thinner caput humeri in dorsal view. *Butastur rufipennis*: very similar, but with a slightly more concave surface of the impressio musculus coracobrachialis cranialis. *Butastur liventer*: complete similarity (Table 55; Figure A6e).

Buteo buteo (Linnaeus, 1758) Common Buzzard

This breeds in Palearctic, NW Iran, N Pakistan, NW India, Nepal, NE China, and Japan. Some northern populations winter in the south to NW Africa, Middle East, Indian subcontinent, and southern China, and rarely in Java, Bali, and the Philippines. It is a scarce to uncommon winter visitor in Myanmar (except Tanasserim), W, NW, NE, C, S Thailand, Peninsular Malaysia, Singapore, Cambodia, N, C Laos, E Tonkin, N, S Annam, and Cochinchina. It is also recorded on a passage to Peninsular Malaysia and Singapore [7] (Supplementary Materials, Map 21). IUCN—LC. Phalanx dist. dig. I pedis sin. NMNHS 12498 (Figure A14p) *Buteo buteo*. Dieu TL: 13.1. The claw phalanx shows the features of Falconiformes (i.e., Accipitriformes) and by its narrower f. a. could be referred to Accipitridae. Its asymmetry suggests a distal (claw) phalanx of the third toe of the left leg. *Accipiter badius* and *Accipiter coloensis*: considerably larger. *Accipiter gentilis*: larger. *Butastur teesa*: slightly smaller; the base of the phalanx is better developed, as it is longer). *Butastur liventer*: resemblance, but relatively longer base of the phalanx. *Buteo buteo*: complete identity (Table 56).

Table 55. Measurements of humerus prox. of fossil and recent Accipitridae (Ref. to Figure A6e).

Species	a	b
Fossil—Dieu		
<i>Butastur cf. liventer</i> NMNH 12352	ca. 14.6	4.4
Recent		
<i>Butastur liventer</i> NHMT 2002.49.1	12.3	4.2
<i>Butastur rufipennis</i> NHMT 2002.49.1	12.2	4.4
<i>Butastur teesa</i> NHMT 2002.42.1	13.3	4.6
<i>Butastur teesa</i> NHMT 1989.16.1	13.4	4.7
<i>Accipiter soloensis</i> NHMT 1850.8.15.	7.9	2.9
<i>Accipiter nisus</i> NHMT 1992.7.1	11.4	3.9
<i>Accipiter gentilis</i> NHMT 1976.60.2	17.7	6.8
<i>Accipiter gentilis</i> NHMT 1860.7.22.15	13.8	5.4
<i>Accipiter badius</i> NHMT 1954.30.23	7.4	3.0
<i>Ictinaetus malayensis</i> NHMT 1969.1.1	18.2	6.5
<i>Haliastur indus</i> 1866.8.7.10	14.0	5.1
<i>Haliastur indus</i> 1871.5.28.1	14.2	5.3
<i>Milvus migrans</i> 1964.1.13	14.4	5.0
<i>Pernis ptilorhynchus</i> NHMT 1845.1.12.19	17.2	7.1
<i>Circus aeruginosus</i> NHMT 1952.2.70	15.7	5.6
<i>Butastur teesa</i> NHMT 1989.16.1	14.0	4.5
<i>Butastur indicus</i> NHMT 1871.7.21.7	12.8	4.6
<i>Nisaetus cirrhatus</i> NHMT 1850.8.15.13	20.4	7.2
<i>Buteo rufinus</i> NHMT 1856.7.20.3	20.7	7.6
<i>Buteo buteo</i> NHMT 1989.17.1	21.5	6.2
<i>Buteo buteo</i> NHMT 1930.3.24.316	14.3	5.7

cf. *Accipiter (gentilis)* (Linnaeus, 1758)/*trivirgatus* (Temminck, 1824))
Northern/Crested Goshawk

Accipiter gentilis: Breeds in Holarctic, NW Africa, NW, N India, Nepal, Buthan, E Tibet, NW, W, and NE China; some northern populations winter in the south in Europe, Pakistan, northern India, south-eastern China, N, S Korea, and S Japan. It is a rare winter visitor of N Myanmar, NW Thailand, W, and E Tonkin. It is a vagrant in S Annam [7]. *Accipiter trivirgatus*: Resident of SW, N, NE India, Nepal, Bhutan, Sri Lanka, south-western and S China, Taiwan, Greater Sundas, Philippines, and recorded in E Bangladesh. It is a fairly common to common resident (except in SW Myanmar, C Thailand), and is rare in Singapore [7]. Phalanx dist. dig. pedis. NMNHS 12418 (Figure A14q,r). Accipitridae gen. Dieu. TL: 19.0. This finding preserves the distal two-thirds of the bone. It shows the typical features of the medium-sized accipitrids. Strigiformes do not have two clear longitudinal edges on the ventral surface, while Falconidae do not have the species of such an opened arc of the bone (even the phalanx dist. dig. I pedis of *Falco rusticolus*). *Nisaetus cirrhatus*: ca. twice smaller. *Buteo rufinus*: ca. twice larger. *Accipiter gentilis*: very similar, both in size and by the arc of curving. As only two species of the larger size of g. *Accipiter* occur in the region (*Accipiter gentilis* and *Accipiter trivirgatus*), the identification of the finding could not be more precise. The lack of the articular does not allow for further identification.

Table 56. Measurements of phalanx dist. dig. 3 pedis sin. of fossil and recent Accipitridae (a—total length; b—maximum width; c—maximum height).

Species	a	b	c
Fossil—Dieu			
<i>Buteo buteo</i> NMNHS 12498	ca. 13.0	3.5	5.5
Recent			
<i>Buteo buteo</i> NHMT1989.17.1	ca. 13.2	ca. 4.0	5.9
<i>Accipiter soloensis</i> NHMT 1850.8.15.64	12.2	2.8	4.5
<i>Accipiter badius</i> NHMT 1954.30.23	11.1	2.9	4.4
<i>Accipiter gentilis</i> NHMT 1996.46.1	ca. 21.0	5.0	ca. 6.8
<i>Accipiter gentilis</i> NHMT 1869.10.19.5	ca. 19.8	4.6	7.0
<i>Accipiter nisus</i> NHMT 1994. 17.1	ca. 12.0	ca. 2.1	3.4
<i>Butastur liventer</i> NHMT 1850.8.15.79	14.3	3.7	5.5
<i>Butastur teesa</i> NHMT 2002.42.1	ca. 14.0	ca. 4.1	ca. 3.7
<i>Butastur teesa</i> NHMT 2002.43.1	ca. 15.8	3.3	4.5
<i>Butastur indicus</i> NHMT 1871.7.21.7	ca. 13.8	ca. 4.2	4.7

cf. *Accipiter (gentilis)* Goshawk

Accipiter gentilis: Breeds of Holarctic, NW Africa, NW, N India, Nepal, Buthan, E Tibet, NW, W, and NE China; some northern populations winter in the south in Europe, Pakistan, northern India, south-eastern China, N, S Korea, and S Japan

It is a rare winter visitor of N Myanmar, NW Thailand, W, and E Tonkin. It is a vagrant in S Annam [7]. Phalanx 3 dig. II pedis sin. NMNHS 12491 (Figure A14s) cf. *Accipiter (gentilis)*. Dieu. The find shows the typical features of medium-sized accipitrids. *Haliaeetus albicilla*: much smaller. *Nisaetus cirrhatus*: similar in general morphology and size. *Nisaetus cirrhatus*: similar in size, but the body of the phallanx is straight, not curved. *Nisaetus nipalensis*: considerably smaller. *Clanga hastata*: similar in shape, but smaller. *Ictinaetus malayensis*: similar in size, but the body of the phalanx is straight, not curved. *Accipiter gentilis*: more robust and straight (Table 57).

Table 57. Measurements of phalanx 3 dig. II pedis of fossil and recent Accipitridae (a—height of f. a. prox.; b—width of f. a. dist.; c—TL).

Species	a	b	c
Fossil—Dieu			
cf. <i>Accipiter (gentilis)</i> NMNHS 12491	ca. 4.7	ca. 4.8	ca. 17.9
Recent			
<i>Accipiter gentilis</i> NHMT 1860.7.22.15	4.6	4.4	19.2
<i>Accipiter gentilis</i> NHMT 1954. 30.20	4.1	3.6	ca.12.2
<i>Clanga hastata</i> NHMT 1995. 22.1	7.0	5.3	25.8
<i>Haliaeetus albicilla</i> NHMT 1846.3.18.3	6.6	7.2	27.5
<i>Buteo buteo</i> NHMT 1989.17.1	3.2	3.9	15.0
<i>Spizaetus nipalensis</i> NHMT 2002.44.1	4.7	6.6	24.2
<i>Nisaetus cirrhatus</i> NHMT 1850.8.15.13	4.0	5.2	18.9
<i>Ictinaetus malayensis</i> NHMT 1969.1.1	5.0	4.2	19.8

3.6. Falconiformes, Sharpe, 1874

3.6.1. Falconidae Leach, 1820

Falco cf. *jugger* J. E. Gray, 1824 Laggar Falcon

This is a resident of the Indian subcontinent (except Buthan and Sri Lanka). It is an uncommon resident of C and S (north) Myanmar [7] (Supplementary Materials, Map 22). IUCN—NT. Tmt. prox. Sin., NMNHS 12408 (Figure A14v) *Falco* cf. *jugger*. Dieu. TL: 13.5. The eminentia intercondylaris (1) is much higher. The crista med. Hypotarsi is missing. The preserved fragment bears typical features for the Falconidae. *Falco peregrinus* is larger, while *Falco subbuteo* and *Falco columbarius* are smaller in size. The Laggar Falcon is the only SE-Asian falcon of intermediate size between the Peregrine Falcon and the Kestrel. It is both morphologically and dimensionally close to the *Falco jugger*, besides the high fragmentarity of the find (Table 58; Figure A6f).

Table 58. Measurements of tmt. Prox. Of fossil and recent Falconidae (Ref. to Figure A6f).

Species	a	b	c
Fossil—Dieu			
<i>Falco</i> aff. <i>Jugger</i> NMNHS 12408	ca. 6.0	4.0	9.5
Recent			
<i>Falco jugger</i> NHMT 1954.30.73	6.8	5.3	10.1
<i>Falco peregrinus</i> UCBL (no number)	6.2	ca.6.0	13.65
<i>Falco peregrinus</i> NHMT 1998.48.19	8.4	6.1	12.6
<i>Falco columbarius</i> NHMT 1930.3.24.265	3.3	4.5	7.3
<i>Falco subbuteo</i> NHMT 1994.39.1	5.0	3.6	7.6

Polihierax Kaup, 1847 sp. (aff. *insignis* Walden, 1872) White-Rumped Falcon

This is endemic. It is a scarce to uncommon resident of SW, C, S Myanmar, north Tenassarim, W, NW, NE Thailand, Cambodia, C, S Laos, S Annam, and Cochinchina [7] (Supplementary Materials, Map 23). IUCN—NT. Ulna dist. Sin., NMNHS 12438 (Figure A14w,x) *Polihierax* sp. (aff. *Insignis*). TL: 22.7. The whole bone is burnt and its colour is blackish-dark-brown. The proximal epiphysis is missing, but the morphology of the preserved distal half clearly suggests a Falconiform bird. *Microhierax caerulescens* and *Microhierax fringillarius*: slightly larger; deeper and better-outlined sulcus radialis. *Polihierax semitorquatus*: high similarity both in morphology and size. The finding has not been compared with *Polihierax insignis*, but its great similarity suggests that the species is the only species of the *Polihierax* species in the Indochina (Table 59; Figure A6g).

Table 59. Measurements of ulna dist. Of fossil and recent Falconidae (Ref. to Figure A6g).

Species	a	b	c
Fossil—Dieu			
<i>Polihierax</i> sp. (aff. <i>Insignis</i>) NMNHS 12438	3.4	3.2	2.3
Recent			
<i>Polihierax semitorquatus</i> NHMT 1952.1.175	3.3	3.2	2.2
<i>Polihierax semitorquatus</i> NHMT 2002.41.1	3.4	3.2	2.4
<i>Microhierax caerulescens</i> NHMT 1850.8.121	2.9	2.8	2.0
<i>Microhierax caerulescens</i> NHMT 1998.23.1	3.0	2.6	2.0
<i>Microhierax caerulescens</i> NHMT 2002.41.2	2.9	2.7	1.9
<i>Microhierax fringillarius</i> NHMT 1952.1.186	2.9	2.4	1.9

3.7. Bucerotiformes Fürbringer, 1888

3.7.1. Bucerotidae Rafinesque, 1815

Anorrhinus L. Reichenbach, 1849 sp. (*tickelli* (Blyth, 1855)) Bown Hornbill

Anorrhinus tickelli: Resident of NE India and SW China. It is an uncommon to locally common resident of W Myanmar, Tennasserim, W, NW, NE Thailand, Cambodia, Laos, W, E Tonkin, N, and C Annam [7] (Supplementary Materials, Map 24). IUCN—NT. Tbt. dist. sin., NMNHS 12338 (Figure A14y,z) *Anorrhinus* sp. (*tickelli*). Dieu. TL: 19.8. This finding shows the specifics for the Bucerotidae flattened (cylindrical) condyles of the distal epiphysis. *Anthracoceros coronatus*: smaller, relatively thicker distal part of the diaphysis, unconcave condylus med. in ventral view. *Anthracoceros malayanus*: a smaller and oval, not round, in shape profile of the condylus med. in medial view; the condylus med. is not constricted in the ventral view and is more trapezium-like than the square-like shape of the distal epiphysis in the ventral view. *Tockus nasatus* and *Tockus erythrorhynchus*: much larger (Table 60; Figure A6h), longer incisura intercondylaris, sharp transition of diaphysis into distal epiphysis. *Penelopides affinis*: larger; condylus med. is not constricted in ventral view. *Rhyticeros undulatus*: much smaller and oval, not round in shape, profile of the condylus med. In a medial view, and the condylus med. is not constricted in the ventral view. *Aceros corrugatus*: much smaller; the condylus med. is not constricted in the ventral view, shorter edge (observed as a small protuberance in the ventral view) on the sulcus cartilagini tibialis. *Aceros plicatus*: similar to the previous species, as well as has a more trapezium-like than square-like shape of the distal epiphysis in a ventral view. *Bycanistes bucinator*: larger, both condyles without concave profile, condylus med. oval, not round in shape, and the condylus med. is not constricted in the ventral view. *Ceratogymna atrata*: smaller, more trapezium-like than rectangular, shape of distal epiphysis in ventral view is an oval, not round, medial view of the condylus med. *Buceros rhinoceros* and *Buceros bicornis*: much smaller. *Buceros hydrocorax semigaleatus*: smaller, much shallower medial edge on sulcus cartilagini tibialis, gradual transition of the distal diaphysis into epiphysis. *B. abyssinicus*: much smaller. Dimensionally it refers to the smaller hornbills of body size, similar to this of the Oriental Pied Hornbill (*Anthracoceros albirostris*) and the Brown Hornbill (*Anorrhinus tickelli*). *Anthracoceros albirostris*: smaller size, a more trapezium-like than square-like shape of the distal epiphysis in a ventral view, a less concave ventral profile of the condylus med., asymmetrical medial condyle in a medial view, longer incisura intercondylaris, reaching up to the axis of distal epiphysis, and a thicker diaphysis and its gradual transition into the distal epiphysis. *Annorhynchus galeritus*: Considerable resemblance. Similar in general features to this genus, but differing by the compared species because of the: smaller size, shorter edge (observed as a small protuberance in the ventral view) on the sulcus cartilagini tibialis, with an absence (less developed) of the epicondylus med. And a less parallel profile of both condyles in a ventral view.

Tbt. dist. dex., NMNHS 12339 (Figure A15a,b) *Anorrhinus* sp. (?*tickelli*). Dieu TL: 19.8. Comparison: as NMNHS 12338 (Table 60). Tbt. dist. dex., NMNHS 12340 (Figure A15c,d) *Anorrhinus* sp. (?*tickelli*). Dieu. TL: 20.0. Comparison: as NMNHS 12338 (Table 60). Tbt. dist. sin., NMNHS 12389 (Figure A15g) *Anorinhus* sp. Dieu. TL: 20.0. This finding represents a distal part of the diaphysis with the preserved proximal part of the distal epiphysis, bearing the typical tendineal facet above the condylus lateralis. Dimensions referred the finding to the medium-sized Hornbills. *Anthracoceros coronatus*: smaller; more flattened distal epiphysis. *Anthracoceros malayanus*: considerably narrower tendineal groove on the lateral surface. *Anthracoceros albirostris*: similar in size and proportions; considerably narrower tendineal groove on the lateral surface. *Buceros*, *Rhinoplax*, and *Bucorvus*: much smaller (see other measurements for tbt.). *Tockus nasatus* and *Tockus erythrorhynchus*: much larger (see other measurements for tbt.). *Bycanistes bucinator*: narrower tendineal groove on the lateral surface; narrower sulcus extensorius in the compared section. *Penelopides affinis*: thicker diaphysis in the distal end. *Aceros corrugatus*: much smaller. *Annorhynchus galeritus*: slightly smaller; similar in the well-outlined tendineal groove on the lateral surface; referred to this genus. This finding could not be referred to any other genus (Table 61; Figure A7a).

Table 60. Measurements of tbt. dist. of fossil and recent Bucerotidae (Ref. to Figure A6h).

Species	a	b	c	d	e	f
Fossil—Dieu						
<i>Anorhinus</i> sp. (<i>tickelli</i>) NMNHS 12338	4.2	9.1	9.2	12.3	11.2	7.3
<i>Anorhinus</i> sp. (<i>tickelli</i>) NMNHS 12339	3.4	8.5	9.3	12.3	11.4	6.6
<i>Anorhinus</i> sp. (<i>tickelli</i>) NMNHS 12340	4.2	9.6	9.3	12.2	10.9	7.0
Recent						
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	4.9	10.2	9.8	12.6	12.0	7.3
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	3.8	8.0	8.9	10.6	10.4	6.2
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	4.8	10.0	10.2	13.9	11.5	7.5
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	4.0	9.5	9.2	11.6	11.0	6.7
<i>Anthracoceros albirostris</i> UCBL A4/168	4.3	8.6	8.8	11.1	10.7	6.3
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	5.7	11.5	11.5	14.4	13.2	8.2
<i>Tockus nasatus</i> NHMT 1989.2.2	2.4	4.9	5.6	7.3	6.6	4.5
<i>Tockus nasatus</i> NHMT 1989.2.1	2.5	5.4	6.6	7.9	7.1	4.8
<i>Tockus nasatus</i> NHMT 1869.2.2.23	2.0	4.4	5.7	6.7	5.8	4.0
<i>Tockus erythrorhynchus</i> NHMT 1997.33.1	2.0	4.3	5.1	6.2	5.6	3.2
<i>Tockus erythrorhynchus</i> NHMT 1999.23.1	1.9	4.3	5.1	6.6	6.2	3.6
<i>Penelopides affinis</i> NHMT 1878.5.20.91	3.1	7.2	8.0	9.9	9.6	5.6
<i>Penelopides affinis</i> NHMT 1878.5.20.92	3.7	7.4	8.0	9.5	9.8	6.4
<i>Anorhynchus galeritus</i> NHMT 1969.1.50	5.0	10.8	11.3	14.6	13.0	7.9
<i>Rhyticeros undulatus</i> NHMT 1972.1.96	7.1	14.6	14.4	18.0	17.1	9.2
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	5.2	11.6	11.7	15.1	15.0	8.2
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	6.8	13.2	12.4	16.3	16.0	9.4
<i>Aceros plicatus</i> NHMT 1859.9.6.204	8.1	18.0	16.8	20.0	19.6	9.8
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	6.2	15.0	13.2	18.2	18.0	10.1
<i>Bycanistes bucinator</i> NHMT 1865.5.9.13	3.4	7.4	7.3	10.0	8.5	5.7
<i>Bycanistes bucinator</i> NHMT 1973.66.135	4.0	9.0	8.6	11.0	11.3	6.4
<i>Ceratogymna atrata</i> NHMT 1980.2.2	5.4	11.7	9.4	12.1	13.4	6.4
<i>Ceratogymna atrata</i> NHMT 1955.5.38	5.6	13.8	11.2	14.4	14.6	13.3
<i>Buceros rhinoceros</i> NHMT 1893.4.28.2	6.6	15.2	14.7	17.3	17.8	-
<i>Buceros bicornis</i> NHMT 1896.2.16.22	8.6	20.0	16.5	21.1	21.0	18.7
<i>Buceros hydrocorax semigaleatus</i> NHMT	5.4	12.0	11.8	13.2	14.1	8.9
<i>Bucorvus abyssinicus</i> NHMT 1956.4.1	10.0	18.4	18.8	22.4	22.6	18.6

Table 61. Measurements of tbt. dist. of fossil and recent Bucerotidae (Ref. to Figure A7a; a—thickness of diaphysis at the tendineal facet; b—width at the same place).

Species	a	b
Fossil—Dieu		
<i>Anorhinus</i> sp. (<i>?tickelli</i>) NMNHS 12389	T	6.5
Recent		
<i>Anthracoceros malayanus</i> NHMT 1952.2.540	5.4	5.9

Table 61. Cont.

Species	a	b
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	5.8	7.2
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	5.8	6.0
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	6.3	7.6
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	6.8	7.6
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	7.6	8.5
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	6.6	7.4
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	9.7	10.4
<i>Penelopides panini affinis</i> NHMT 1878.5.20.91	5.0	5.8
<i>Penelopides panini affinis</i> NHMT 1878.5.20.92	4.3	5.6
<i>Bycanistes bucinator</i> NHMT 1973.66.135	5.8	6.9

Humerus sin. dist. NMNHS 12336 (Figure A15h) *Anorrhinus* sp. (*tickelli*). Dieu. TL: 57.4. Comparison: as NMNHS 12337 (Table 62; Figure A7b).

Table 62. Comparison of the measurements of humerus dist. of fossil and recent Bucerotidae (Ref. to Figure A7b; e—minimum width of diaphysis;).

	a	b	c	d	e
Fossil—Dieu					
<i>Anorrhinus</i> sp. (<i>tickelli</i>) NMNHS 12336	12.0	5.2	5.9	22.9	ca. 9.0
<i>Anorrhinus malayanus</i> NMNHS 12337	11.7	5.3	5.2	22.8	ca.9.0
Recent					
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	12.8	5.2	5.7	25.0	7.9
<i>Anthracoceros albirostris</i> UCBL A4/168	10.9	3.8	4.3	20.5	10.0
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	9.7	3.8	4.0	18.6	6.4
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	10.5	5.0	5.0	22.0	7.8
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	10.8	4.3	4.5	20.2	8.3
<i>Anthracoceros albirostris</i> UCBL A4/168					
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	13.0	5.3	5.8	24.8	8.9
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	ca. 12.2	-	5.9	22.7	8.1
<i>Tockus nasatus</i> NHMT 1989.2.1	7.3	3.4	3.5	14.8	5.0
<i>Tockus nasatus</i> NHMT 1989.2.2	7.0	3.4	3.1	13.7	4.8
<i>Tockus erythrorhynchus</i> NHMT 1997.33.1	5.4	2.4	2.2	10.8	3.6
<i>Tockus erythrorhynchus</i> NHMT 1999.23.1					
<i>Penelopides affinis</i> NHMT 1878.5.20.92	9.3	4.0	3.8	16.8	6.2
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	16.6	6.2	5.6	26.2	9.6
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	17.4	6.2	6.0	27.8	11.2
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	18.2	8.1	7.3	33.2	11.6
<i>Bycanistes bucinator</i> NHMT 1865.5.9.13	12.0	4.5	5.2	21.2	8.5
<i>Ceratogymna atrata</i> NHMT 1955.5.38	12.0	5.0	5.3	23.6	8.6

Table 62. Cont.

	a	b	c	d	e
<i>Buceros rhinoceros</i> NHMT 1893.4.28.2	19.3	7.8	7.8	34.0	11.6
<i>Buceros bicornis</i> NHMT 1896.2.16.22	22.0	9.1	8.5	39.9	13.2
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.6.20.93	12.4	15.0	5.5	25.1	8.2
<i>Bucorvus abyssinicus</i> NHMT 1956.4.1	2.0	9.2	8.0	36.8	13.6

Humerus dist. sin., NMNHS 12337 (Figure A15i,j) *Anorhynchus malayanus*. Dieu. TL: 45.2. *Anthracoceros coronatus*: shorter epicondylus ventralis. *Ceratogymna atrata*: smaller; shorter condylus dorsalis and deeper f. olecrani. *Bycanistes bucinator*: shorter epicondylus ventralis and unconstricted condylus dorsalis in its base at the f. musculus brachialis in a dorsal view. *Penelopides affinis*: larger; wider, and deeper fossa olecrani. *Tockus erythrorhynchus*: much larger. *Buceros bicornis*, *Buceros rhinoceros*, and *Bucorvus abyssinicus*, *Rhyticeros subruficollis*, *Rhyticeros undulatus*, *Aceros corrugatus*, and *Anthracoceros coronatus*: much smaller. *Buceros hydrocorax*: deeper and longer f. olecrani. *Anthracoceros albirostris*: condylus dorsalis is not constricted in its base at f. musculus brachialis in a dorsal view. *Anorhynchus galeritus*: high similarity, but smaller; relatively thicker diaphysis (i.e., the correlation d: e). *Anthracoceros malayanus*: completely identified, except for the slightly thicker condylus ventralis (Table 62).

Buceros Linnaeus, 1758 sp./*Buceros* cf. *bicornis* Linnaeus, 1758 Hornbill/Great Indian Hornbill

Buceros bicornis: Resident of SW India, N, NE Indian subcontinent, SW China, and Sumatra. Scarce to locally common resident (except C Thailand and Singapore) [7] (Supplementary Materials, Map 25). IUCN—VU. Femur prox. dex., NMNHS 12379 (Figure A15k,l); *Buceros* sp./*Buceros* cf. *bicornis*. Dieu. TL: 62.2. Measurements: g—distance between the highest points of condylus med. and condylus lateralis. *Ceratogymna atrata*, *Anthracoceros albirostris*, *Anthracoceros malayanus*, *Anthracoceros coronatus*, *Bycanistes bucinator*, *Anorhynchus galeritus*, *Tockus erythrorhynchus*, *Penelopides affinis*, and *Tockus nasatus*: much larger. *Rhinoplax vigil*: larger; higher crista trochanteris. *Bucorvus abyssinicus*: similar in size; larger crista trochanteris. *Buceros hydrocorax semigaleatus*: much smaller. We could not compare the fossil specimen with *Aceros nipalensis*, but the comparison with three other species of this genus, *Aceros corrugatus*, *Rhyticeros subruficollis*, and *Rhyticeros undulatus* shows that the NMNHS 12379 is much larger, has a higher crista trochanteris, and well-developed column capitis femori. These features distinguish it from the genus *Aceros*. *Buceros rhinoceros*: similar; larger; better developed column capitis femori; higher crista trochanteris; more dorsal than lateral, i.e., the medial position of the fovea ligamenti capitis. *Buceros bicornis*: very similar; larger; better developed column capitis femori and crista trochanteris. These features distinguish the finding NMNHS 12379 from *Buceros bicornis* (Table 63; Figure A7c).

Radius sin. NMNHS 12345 *Buceros* sp./*Buceros* cf. *bicornis*. Dieu. TL: 33.3. This finding is a very small fragment of the medial part of diaphysis corresponding to the section between the fourth and fifth papillae remigales caudales of the neighbour bone, the ulna. The medio-lateral diameter: 4.5; dorso-ventral diameter—5.5. The same measurements of one specimen of *Buceros bicornis* (NHMT 1896.2.16.22) are as follows: 7.3 and 6.2, respectively. The same of *Buceros rhinoceros* (NHMT 1893.4.28.2) are: 6.4 and 5.0. The fossil specimen differs from *Buceros rhinoceros* by the more right diaphysis. The lineae intermusculares are clearly preserved and their orientation completely corresponds to *Buceros bicornis*. It is dimensionally similar to the compared specimen of *Buceros bicornis*.

Table 63. Measurements of femur of fossil and recent Bucerotidae (Ref. to Figure A7c; a—distance between the highest points of condylus med. and condylus lateralis).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Anthracoceros albirostris</i> NMNHS 12375	-	5.5	5.2	-	13.1
<i>Buceros</i> sp./ <i>Buceros</i> cf. <i>bicornis</i> NMNHS 12379	-	10.5	8.8	21.5	25.0
Recent					
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	5.1	7.2	6.5	12.0	15.7
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	4.1	5.0	5.0	8.9	12.4
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	5.2	5.6	4.7	10.0	14.6
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	4.9	5.6	5.6	9.8	12.6
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	6.0	6.5	5.9	12.5	16.0
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	4.9	6.4	6.0	11.7	14.4
<i>Tockus nasatus</i> NHMT 1989.2.1	3.4	3.7	3.2	6.8	8.6
<i>Tockus erythrorhynchus</i> NHMT 1997.33.1	2.7	2.7	2.7	5.4	6.8
<i>Penelopides affinis</i> NHMT 1878.5.20.91	4.1	4.7	3.8	9.4	11.7
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	6.5	7.4	6.9	12.0	17.0
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	5.8	8.3	6.8	14.9	18.4
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	8.6	9.1	8.4	15.9	20.9
<i>Rhyticeros subruficollis</i> NHMT 1859.9.6.204	7.9	10.2	8.8	18.8	24.4
<i>Bycanistes fustinator</i> NHMT 1865.5.9.13	3.6	4.6	4.6	7.8	11.2
<i>Bycanistes bucinator</i> NHMT 1973.66.135	5.0	6.1	5.7	11.2	12.6
<i>Ceratogymna atrata</i> NHMT 1980.2.2	5.2	6.5	6.1	11.3	15.0
<i>Buceros rhinoceros</i> NHMT 1893.4.28.2	6.9	9.5	7.4	15.4	22.4
<i>Buceros bicornis</i> NHMT 1955.20.1	8.4	10.3	9.7	17.4	22.9
<i>Buceros bicornis</i> NHMT 1896.2.16.22	8.1	11.1	10.5	17.4	24.7
<i>Buceros bicornis</i> NHMT 1988.46.1	6.9	9.1	8.1	5.8	2.5
<i>Rhinoplax vigil</i> NHMT 1952.2.550	8.2	9.4	8.1	17.4	23.6
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.6.20.93	5.4	7.0	5.8	12.2	17.2
<i>Bucorvus abyssinicus</i> NHMT 1869.2.2.18	11.2	11.8	10.3	22.4	27.3
<i>Bucorvus abyssinicus</i> NHMT 1952.2.553	10.1	10.8	9.8	21.0	25.2
<i>Bucorvus abyssinicus</i> NHMT 1956.4.1	9.5	9.7	8.3	21.0	19.0
<i>Bucorvus abyssinicus</i> NHMT 1956.4.2	11.0	11.0	9.8	22.6	26.4

Anthracoceros albirostris Shaw and Nodder, 1807 Oriental Pied Hornbill

This is a resident of N, NE Indian subcontinent, E India, SW, S China, and Greater Sundas. It is an uncommon to locally common resident (except C Thailand, and it is rare in Singapore) [7] (Supplementary Materials, Map 26). IUCN—LC. Coracoid omal sin., NMNHS 12325 (Figure A15e,f) *Anthracoceros albirostris*. Maxa I. TL: 19.3. *Ceratogymna atrata*: considerable similarity; f. a. clavicularis les protruded with a rounder pr. acrocoracoideus. *Anthracoceros coronatus*: similar in size; shorter f. a. humeralis, and the sulcus muscoli supra-coracoidei is angular and not bow-like. *Rhyticeros undulatus*: smaller; it is rounder than the sharply edged f. a. clavicularis. *Penelopides affinis*: larger, with a thicker pr. acrocoracoideus. *Rhinoplax vigil* and *Buceros bicornis*: much smaller. *Buceros hydrocorax semigaleatus*: similar in size; it is a less cranially directed acrocoracoidal part. *Bycanistes bucinator*: similar in size; it is a less caudally protruded f. a. humeralis in the lateral view. *Rhyticeros subruficollis* and

Buceros rhinoceros: much smaller. *Tockus nasatus* and *Tockus erythrophthalmus*: much larger. *Bucorvus abyssinicus*: much smaller. *Aceros corrugatus*: smaller; similar in general; more open sulcus musculi supracoracoidei. *Annorhynchus galeritus*: very close; it is a less protruded caudally f. a. humeralis in the lateral view. *Anthracoceros malayanus*: similar in size; shorter f. a. humeralis. *Anthracoceros albirostris*: morphologically and dimensionally fits with that species (Table 64; Figure A7d).

Table 64. Measurements of coracoid omal of fossil and recent Bucerotidae (Ref. to Figure A7d).

Species	a	b	c
Fossil—Maxa I			
<i>Anthracoceros albirostris</i> NMNHS 12325	4.8	15.7	5.5
<i>Anthracoceros albirostris</i> NMNHS 12344	4.0	-	5.4
Recent			
<i>Anthracoceros albirostris</i> UCBL A4/168	4.5	13.9	5.0
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	-	12.7	5.7
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	5.5	12.3	5.0
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	-	14.7	4.5
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	6.1	13.6	5.8
<i>Anorhynchus galeritus</i> NHMT 1969.1.50	5.5	7.0	6.7
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	-	15.3	5.1
<i>Penelopides affinis</i> NHMT 1878.5.20.91	ca. 6.4	12.8	3.9
<i>Rhyticeros undulatus</i> NHMT 1972.1.96	8.2	22.8	7.9
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	6.6	18.2	7.2
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	6.8	18.4	8.0
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	8.0	23.6	8.2
<i>Bycanistes bucinator</i> NHMT 1973.66.135	5.2	15.8	5.4
<i>Ceratogymna atrata</i> NHMT 1980.2.2	5.2	16.5	5.7
<i>Ceratogymna atrata</i> NHMT 1955.5.38	-	19.4	6.0
<i>Tockus nasatus</i> NHMT 1989.2.2	3.5	8.9	3.4
<i>Tockus erythrophthalmus</i> NHMT 1997.33.1	2.9	7.4	2.9
<i>Buceros rhinoceros</i> NHMT 1869.10.19.10	7.2	22.0	7.8
<i>Buceros bicornis</i> NHMT 1988.46.1 7.2	7.2	22.5	10.1
<i>Rhinoplax vigil</i> NHMT 1952.2.550	7.0	25.8	9.1
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.5.20.94	-	15.7	7.0
<i>Bucorvus abyssinicus</i> NHMT 1956.4.1	7.9	24.7	11.7

Coracoid omal dex., NMNHS 12344 (Figure A15m) *Anthracoceros albirostris*. TL: 15.3. This finding represents a bone splinter of a distal coracoid, preserving f. a. humeralis, sulcus musculi supracoracoidei and part of the distal diaphysis. *Anthracoceros malayanus*: similar in size; shorter f. a. humeralis. *Anthracoceros coronatus*: similar in size; shorter f. a. humeralis. *Rhyticeros undulatus*: smaller. *Penelopides affinis*: larger; thicker pr. acrocoracoideus. *Rhinoplax vigil* and *Buceros bicornis*: much smaller. *Bycanistes bucinator*: similar in size; less caudally protruded f. a. humeralis in lateral view. *Rhyticeros subruficollis* and *Buceros rhinoceros*: much smaller. *Tockus nasatus* and *Tockus erythrophthalmus*: much larger. *Aceros corrugatus*: smaller; more open sulcus musculi supracoracoidei. *Annorhynchus galeritus*: smaller; less protruded caudally f. a. humeralis in lateral view. *Bucorvus abyssinicus*: much smaller. Morphologically and dimensionally, it completely corresponds to the *Anthracoceros albirostris*

(Table 64). Femur prox. sin., NMNHS 12375 (Figure A15n,o) *Anthracoceros albirostris*. Dieu. TL: 19.7. *Ceratogymna atrata*: smaller; less prominent caput femori in the cranial direction. *Annorhynchus galeritus*: deeper tendineal facet (groove) on the f. a. antitrochanterica. *Anthracoceros coronatus*: smaller; shorter crista trochanteris. *Bycanistes bucinator*: similar in size, but has thinner column capitis femori. *Tockus erythrorhynchus* and *Tockus nasatus*: larger; much thicker column capitis femori. *Penelopides affinis*: larger; deeper fovea ligamenti capitis. *Anthracoceros malayanus*: slightly smaller; less protruded caput femoris. *Aceros corrugatus*: much smaller. *Rhyticeros subruficollis*: much smaller. *Rhyticeros undulatus*: smaller. *Rhinoplax vigil*: much smaller. *Bucorvus abyssinicus*: much smaller. *Buceros hydrocorax semigaleatus*: smaller; deeper fovea ligamenti capitis. *Buceros bicornis*: much smaller. *Buceros rhinoceros*: much smaller. *Anthracoceros albirostris*: slightly smaller, but shows a high similarity in all details (Table 63; Figure A7e). Femur prox. sin., NMNHS 12383 (Figure A15p) *Anthracoceros albirostris*. Dieu. TL: 23.4. The general shape and proportions suggest a smaller bucerotid. *Bycanistes bucinator sharpii*: bigger; it has an absence of the pneumatic foramen on the base of the crista trochanteris; higher crista trochanteris in med. View, with relatively smaller caput femori. *Ceratogymna atrata*: smaller. *Penelopides panini affinis*: bigger; absence of pneumatic foramen on the base of crista trochanteris. *Anorrhynchus galeritus*: smaller; caput femori are more flattened in the cranial view. *Anthracoceros malabaricus*: complete similarity. Other comparisons: as for NMNHS 12375 (Table 65; Figure A7e).

Table 65. Measurements of femur prox. of fossil and recent Bucerotidae (Ref. to Figure A7e).

Species	a	b	c
Fossil—Dieu			
<i>Anthracoceros albirostris</i> NMNHS 12383	10.7	12.6	5.8
Recent			
<i>Anthracoceros malabaricus</i> NHMT 1881.1.17.72	10.1	13.8	6.2
<i>Anorrhynchus galeritus</i> NHMT 1952. 2.540	9.6	11.6	5.6
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	12.3	15.7	7.2
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	9.1	12.5	5.0
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	9.9	13.0	5.6
<i>Bycanistes bucinator sharpii</i> NHMT 1865.5.9.13	8.0	11.0	4.6
<i>Bycanistes bucinator sharpii</i> NHMT 1973.66.135	10.1	13.7	6.0
<i>Penelopides panini affinis</i> NHMT 1878.5.20.92	8.9	11.9	9.9
<i>Ceratogymna atrata</i> NHMT 1955.5.38	13.4	17.8	7.9

Tmt. dist. dex., NMNHS 12324 (Figure A15q,r) *Anthracoceros* cf. *albirostris*. Dieu. TL: 38.6. *Anthracoceros albirostris*: considerable morphological similarity, and all trochleae metatarsi have shallower relief (a subspecific difference). *Anthracoceros coronatus*: smaller; cylindrical, not concave, tr. mt. IV. *Anthracoceros malayanus*: slightly smaller; blunter crista plantaris mediana on caudal surface. *Annorhynchus galeritus*: smaller, but very close; less cranially curved diaphysis in the lateral view. *Ceratogymna atrata*: much more slender than the robust diaphysis; narrower distal epiphysis. *Buceros hydrocorax semigaleatus*: smaller; the diaphysis is slender, and the crista med. hypotarsi is better developed and continues to the distal third of the bone. *Rhyticeros undulatus*: much smaller; sulcus extensorius is considerably deeper. *Penelopides affinis*: similar in size; it has a thicker diaphysis, deeper sulcus extensorius, and blunter crista med. hypotarsi. *Buceros bicornis* and *Buceros rhinoceros*: much smaller. *Bucorvus abyssinicus*: much smaller; strongly differs by the flattened, not cylindrical, section of the diaphysis and deeper sulcus extensorius. *Aceros corrugatus*: much smaller; deeper sulcus extensorius, with its medial edge uninterrupted at the fossa metatarsi I. *Bycanistes bucinator*: much smaller; slender diaphysis and deeper sulcus exten-

sorius. *Bycanistes bucinator*: similar in size; sulcus extensorius more medially positioned on the facies dorsalis, with a smaller foramen vasculare distale (Table 66; Figure A7f).

Table 66. Measurements of tmt. dist. of fossil and recent Bucerotidae (Ref. to Figure A7f).

Species	a	b	c	d	e	f
Fossil—Maxa						
<i>Anthracoceros albirostris</i> NMNHS 12324	8.3	12.0	6.3	7.1	5.0	4.0
Recent						
<i>Anthracoceros albirostris</i> UCBL A4/168	8.3	12.15	5.1	6.7	5.5	4.3
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	8.9	13.3	5.9	6.8	5.2	4.8
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	8.0	11.5	6.5	6.0	5.0	4.1
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	8.6	12.0	6.5	6.6	5.7	4.6
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	10.2	14.7	6.9	7.9	6.4	4.7
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	9.8	14.2	6.5	7.7	5.1	4.6
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	9.5	13.8	ca. 6.9	7.0	4.8	-
<i>Penelopides affinis</i> NHMT 1878.5.20.91	7.7	11.1	4.6	5.0	4.3	ca. 3.5
<i>Penelopides affinis</i> NHMT 1878.5.20.92	6.9	10.8	5.4	5.7	4.3	4.2
<i>Rhyticeros undulatus</i> NHMT 1972.1.96	14.1	19.9	9.4	10.1	7.1	6.7
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	11.2	16.0	7.7	9.0	5.8	5.7
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	12.0	16.9	7.7	9.5	6.7	6.1
<i>Rhyticeros subruficollis</i> NHMT 1859.9.6.204	15.1	21.0	9.6	11.4	8.3	8.7
<i>Bycanistes bucinator</i> NHMT 1973.66.135	8.3	11.4	5.0	6.0	5.2	5.7
<i>Ceratogymna atrata</i> NHMT 1980.2.2	10.9	14.9	15.4	8.4	6.2	4.8
<i>Ceratogymna atrata</i> NHMT 1955.5.38	12.4	17.3	8.4	8.6	6.6	-
<i>Buceros rhinoceros</i> NHMT 1893.4.28.2	14.9	19.8	9.7	11.0	7.9	7.3
<i>Buceros bicornis</i> NHMT 1955.20.1	15.8	22.6	9.0	16.5	9.3	7.3
<i>Rhinoplax vigil</i> NHMT 1952.2.550						
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.5.20.94	11.1	16.7	6.8	6.0	6.1	5.5
<i>Bucorvus abyssinicus</i> NHMT 1869.2.2.18	17.5	26.0	15.2	13.8	10.4	ca. 13.0

Vertebra thoracalis V NMNHS 12504 (Figure A15s) Dieu. *Anthracoceros albirostris*. TL: 12.8. The dimensions suggest a small-sized hornbill. The morphological comparison shows complete identity of the find with *Anthracoceros albirostris*. In most cases, we do not cite comparative measurements, because of the fact that all the necessary comparative specimens of Bucerotidae at the used collection (the NHMT) are kept articulated, which does not allow for taking measurements (Table 67).

Quadratum sin. NMNHS 12433 (Figure A15t,u) *Anthracoceros* cf. *albirostris*. Dieu. TL: 19.0. Pr. orbitalis quadrati and capitis oticus have been broken. *Anthracoceros coronatus*: smaller; less-developed condylus caudalis. *Ceratogymna atrata*: smaller; the condylus lateralis is less rounded. *Buceros hydrocorax semigaleatus* and *Rhyticeros undulatus*: smaller. *Bucorvus abyssinicus*: absence of an articular constriction on condylus med. Completely resembles (morphologically and dimensionally) the *Anthracoceros albirostris* (Table 68; Figure A7g).

Table 67. Measurements of vertebra thoracalis V of fossil and recent Bucerotidae (a—width of f. a. cranialis; b—width of f. a. caudalis; c—cranial vertical deameter of foramen vertebrae; d—length of corpus vertebrae).

Species	a	b	c	d
Fossil—Dieu				
<i>Anthracoceros albirostris</i> NMNHS 12504	7.1	6.4	4.1	11.2
Recent				
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	8.7	7.1	6.1	12.0
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10	-	-	-	ca. 11.4
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	-	-	-	ca. 11.7
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	-	-	-	ca. 10.9
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	-	-	-	12.3
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	-	-	-	16.0
<i>Ceratogymna atrata</i> NHMT 1955.5.38	-	-	-	11.6
<i>Buceros rhinoceros</i> NHMT 1869.10.19.10	-	-	-	14.8
<i>Buceros bicornis</i> NHMT 1988.46.1	-	-	-	17.7
<i>Rhinoplax vigil</i> NHMT 1952.2.550	12.9	11.6	7.7	17.3
<i>Penelopides affinis</i> NHMT 1878.5.20.91	-	-	-	8.7
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.5.20.94	-	-	-	ca. 12.7
<i>Bucorvus abyssinicus</i> NHMT 1952.2.553	-	-	-	16.1

Table 68. Measurements of os quadratum of fossil and recent Bucerotidae (Ref. to Figure A7g).

Species	a	b	c	d
Fossil—Dieu				
<i>Anthracoceros cf. albirostris</i> NMNHS 12433	4.7	8.8	14.4	8.4
Recent				
<i>Anthracoceros albirostris</i> UCBL A-4/168	5.0	ca. 8.9	15.6	8.6
<i>Anthracoceros albirostris</i> UCBL A4/168				
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	5.3	9.6	16.2	-
<i>Anthracoceros albirostris</i> NHMT 1867.10.5.10				
<i>Anthracoceros albirostris</i> NHMT 1891.7.20.20	5.2	9.4	15.5	-
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	6.5	11.7	-	11.1
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50				
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	5.1	-	-	-
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	5.8	10.9	18.7	-
<i>Aceros corrugatus</i> NHMT 1869.10.19.11				
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	6.7	13.2	21.8	-
<i>Bycanistes bucinator</i> NHMT 1973.66.135				
<i>Ceratogymna atrata</i> NHMT 1955.5.38	5.8	12.3	-	-
<i>Buceros rhinoceros</i> NHMT 1893.4.28.2	6.7	13.7	19.9	-

Table 68. Cont.

Species	a	b	c	d
<i>Buceros bicornis</i> NHMT 1896.2.16.22	7.8	16.3	22.5	-
<i>Rhinoplax vigil</i> NHMT 1952.2.550				
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.5.20.94	4.7	9.7	15.6	-
<i>Bucorvus abyssinicus</i> NHMT 1956.4.1	6.9	10.4	19.4	13.8

cf. *Rhyticeors undulatus* (Shaw, 1811) Wreathed Hornbill

Rhyticeors undulatus: Resident of NE India, Buthan, SW China, Greater Sundas, and formerly Bangladesh. It is an uncommon to locally common resident (except E Myanmar, C Thailand, Singapore, W, and E Tonkin) [7]. (Supplementary Materials, Map 27). IUCN—VU. Ulna dist. dex., NMNHS 12378 (Figure A15v,w) cf. *Rhyticeors undulatus*. Dieu. TL: 60.5. This finding belongs to the largest species of the family. *Anthracoceros coronatus*: much larger; the lateral profile of the condylus dorsalis is round, not oval. *Buceros rhinoceros*: thicker diaphysis, less protruded papillae remigales caudales, and more round than oval with the shape of the condylus dorsalis in the lateral view. *Buceros bicornis*: very close, but the position of the papillae remigales caudales is more frequent and the lateral profile of condylus dorsalis is rounder than oval. *Anthracoceros malayanus* and *Anthracoceros albirostris*: much larger, relatively more frequent position of papillae remigales caudales. *B. abyssinicus*: relatively more frequent position of papillae remigales caudales; the absence of transversal (diagonal) grooves against each papilla remigalis caudalis on the medial surface of the diaphysis of *Penelopides affinis*, *Tockus nasatus*, *Tockus erythrorhynchus*, and *Bycanistes bucinator* are much larger, more round than oval, with the shape of the condylus dorsalis in a lateral view. *Aceros corrugatus*: larger; less-developed papillae remigales caudales, and the lateral profile of the condylus dorsalis is round, not oval. *Annorhynchus galeritus*: larger; a relatively more frequent position of papillae remigales caudales. *Ceratogymna atrata*: larger; less developed tuberculum retinaculi and papillae remigales caudales. *Bycanistes bucinator*: much larger; the lateral profile of condylus dorsalis is round, not oval. *Buceros hydrocorax semigaleatus*: relatively more frequent position of papillae remigales caudales, with a more round than oval shape of the condylus dorsalis in a lateral view. *Rhyticeors subruficollis*: similar in size and in general morphology, but the papillae remigales caudales are situated more frequently. *Rhyticeors undulatus*: significant similarity, longer condylus ventralis in ventral view, completely refers to g. *Aceros*, and even to *Rhyticeors undulatus*, but the more frequent position of papillae remigales caudales possibly suggest a distinct subspecies (Table 69; Figure A7h).

Table 69. Measurements of ulna dist. Of fossil and recent Bucerotidae (Ref. to Figure A7h; g—distance between the firstst and the third papilla remigalis caudalis, numbered from distal to proximal part of the bone; f—thickness of diaphysis at third papilla remigalis caudalis;).

Species	a	b	c	d	e	f	g
Fossil—Dieu							
<i>Aceros</i> sp. /(cf. <i>Rhyticeors undulatus</i> NMNHS 12378	11.4	18.2	17.4	16.4	11.9	11.6	28.6
Recent							
<i>Aceros corrugatus</i> NHMT 1869.10.19.11	10.5	17.3	15.0	13.8	10.2	9.8	35.1
<i>Anthracoceros albirostris</i> NHMT 1866.7.3.17	-	13.0	12.1	11.0	8.1	7.6	29.6
<i>Anthracoceros coronatus</i> NHMT 1868.12.22.3	8.3	14.5	ca. 14.6	ca. 12.1	9.0	8.0	28.5

Table 69. Cont.

Species	a	b	c	d	e	f	g
<i>Anorrhynchus galeritus</i> NHMT 1969.1.50	-	14.4	12.8	11.8	8.0	7.1	32.4
<i>Anthracoceros malayanus</i> NHMT 1848.10.31.4	-	13.1	12.7	10.7	8.3	7.5	23.3
<i>Penelopides affinis</i> NHMT 1878.5.20.91	8.2	10.2	9.3	8.2	6.5	6.8	21.0
<i>Rhyticeros undulatus</i> NHMT 1972.1.96	-	18.4	ca. 17.6	ca. 15.5	11.4	10.9	37.5
<i>Rhyticeros undulatus</i> NHMT 1961.9.1	9.7	16.2	14.8	13.6	9.9	8.9	22.4
<i>Rhyticeros subruficollis</i> NHMT 1893.4.28.1	-	19.7	17.9	10.8	12.0	16.0	31.2
<i>Bycanistes bucinator</i> NHMT 1973.66.135	8.0	13.3	11.8	10.3	7.9	7.2	26.2
<i>Bycanistes bucinator</i> NHMT 1865.5.9.13	-	10.8	10.6	8.7	6.5	5.8	23.2
<i>Ceratogymna atrata</i> NHMT 1980.2.2	8.8	13.3	13.9	12.0	8.9	8.0	27.0
<i>Ceratogymna atrata</i> NHMT 1955.5.38	-	16.5	15.1	ca. 13.6	ca. 10.4	ca. 9.4	35.8
<i>Buceros rhinoceros</i> NHMT 1869.10.19.10	10.7	13.5	17.2	15.2	10.8	9.4	34.7
<i>Buceros rhinoceros</i> NHMT 1893.4.28.2	-	ca. 19.2	18.6	17.4	12.4	11.7	36.2
<i>Buceros bicornis</i> NHMT 1955.20.1	11.3	20.0	18.9	17.2	12.9	11.3	36.6
<i>Buceros bicornis</i> NHMT 1896.2.16.22	12.3	22.4	21.4	18.9	13.4	17.2	41.4
<i>Rhinoplax vigil</i> NHMT 1952.2.550							
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.5.20.94	-	14.7	13.3	12.0	9.1	7.6	31.0
<i>Buceros hydrocorax semigaleatus</i> NHMT 1878.5.20.93	ca. 8.4	15.1	13.5	11.9	8.6	7.8	30.0
<i>Bucorvus abyssinicus</i> NHMT 1956.4.1	12.7	19.7	18.6	18.6	13.8	12.3	36.5
<i>Tockus nasatus</i> NHMT 1989.2.2	5.1	8.3	5.1	6.7	5.1	4.9	17.4
<i>Tockus erythrorhynchus</i> NHMT 1999.23.1	3.9	6.9	6.7	5.5	4.5	4.4	14.8

Rhinoplax vigil Forster, 1781 Helmeted Hornbill

This is a resident of Sumatra and Borneo. It is a scarce to uncommon resident of Tennaserim, S Thailand, and Peninsular Malaysia [7] (Supplementary Materials, Map 28). IUCN—CR. Os premaxillae, NMNHS 12481 (Figure A15x–z) *Rhinoplax vigil*. Dieu. TL: 25.4. All of the three measurements are taken at the level of the third centimeter from the bill tip (aside from its absence, it is easy to localize it by following the lines of the profile.). The fragment is very small, but sufficient to distinguish it from all Gaviiformes, Pelecaniformes, Ciconiiformes, Gruiformes, and Piciformes, which have some species of right bills. Its right crista tomialis is very diagnostic. The only known bird in the SE-Asian region with such a straight, relatively short and robust (not slender), and not bent bill is the Helmeted Hornbill, to whom the find also corresponds dimensionally. It has not been compared with the skulls of *Rhinoplax vigil* because of the lack of comparative osteological material. The comparison of NMNHS 12481 with skin specimens of the collection of the NHMT shows complete similarity in size, shape, and proportion with the upper jaw of the bill of the Helmeted Hornbill. We also compared the finding with two partly cleaned up heads of the *Rhinoplax vigil* (NHMT 1952.2.549 and NHMT 1952.2.551). The measurements for other specimens are not referred because their ramphotheca is not removed (i.e., they are incomparable). It deserves to be mentioned that some individuals have slightly curved bills and others have straight bills, which is possibly an age or sex variability. A morphological comparison shows a complete identity of the analogous premaxillary part of *Rhinoplax vigil*. At present, this species is spread in the Malay Peninsula (Table 70; Figure A7i).

Table 70. Measurements of os premaxillare of aff. *Rhinoplax vigil* (Ref. to Figure A7i).

Species	a	b	c
Fossil—Dieu			
aff. <i>Rhinoplax vigil</i> NMNHS 12481	8.4	8.6	1.7
Recent			
<i>Rhinoplax vigil</i> NHMT 1952.2.249	10.2	9.8	2.6
<i>Rhinoplax vigil</i> NHMT 1952.2.251	9.5	10.3	-

3.8. *Caprimulgiformes* Ridgway, 1881

3.8.1. Apodidae Hartert, 1897

aff. *Hirundapus* Hodgson, 1837 sp. (aff. *Hirundapus giganteus* (Temminck, 1825)) Needletail

Hirundapus giganteus: Resident of SW, NE India, SE Bangladesh, Sri Lanka, Andaman Is, Grater Sundas, and the Philippines (Palawan). It is an uncommon to common resident throughout. It is possibly only a breeding visitor to some (more northerly) areas [7] (Supplementary Materials, Map 29). IUCN—LC. Humerus sin., NMNHS 12569 (Figure A16a,b) aff. *Hirundapus giganteus*. Dieu (archaeologist's No s-444). *Tachymarptis melba*: similar in size; more proximal position of tuberculum (processus) dorsale; short and large, instead of distally elongated intumescencia (a clear indication of generic difference). *Apus pacificus*, *Apus acuticauda*, and *Apus affinis* (the only species of the genus *Apus*, which is spread in SE Asia at present): considerably larger. *Hirundapus comata*: shorter and thicker robust bone; tuberculum (processus) dorsale considerably elongated and directed caudally. *Hirundapus caudacutus* (not compared): This species is larger than *Tachymarptis melba*, while *T. melba* has a slightly larger humeral bones than the compared specimen. To compare with the smallest species of *Hirundapus*, the *Rhaphidura leucopygialis* species is much larger (this species is 20–25 percent smaller than the smallest species of g. *Apus*, *A. affinis*, in the SE Asia; [6,26]. *Cypsiurus balasiensis*: much larger (*C. balasiensis* is also smaller than the *Apus affinis*; [6,26]. *Collocalia esculenta*; much larger. *Chaetura pelagica*: much larger; the caudal part of the intumescencia is clearly limited by a bow-like curved edge, instead of a diagonally directed edge. *Hydrochous gigas*, *Aerodramus fuciphagus*, *Aerodramus maximus*, *Aerodramus brevirostris*, and *Collocalia esculenta*: much larger (all of these species are up to 30 percent smaller than the largest species of g. *Apus* in the region, *Apus pacificus*; [6,26]. Thus, all swifts of the Apodidae family, which are spread at present throughout the whole SE-Asian region, are excluded from our comparison. *Hirundapus caudacutus* and *H. cochinchinensis* are of almost the same size as *Apus pacificus* [6,26] and due to its dimensions could also be eliminated. Thus, *H. giganteus* is the only swift, spread in the region at present; however, the finding remained uncomparated with it (Table 71).

3.9. *Piciformes* Meyer & Wolf, 1810

3.9.1. Megalaimidae Blyth, 1852

Psilopogon javensis (Horsfield, 1821) Black-Banded Barbet

It is not listed by [7]. Java [31] (Supplementary Materials, Map 30). IUCN—NT. Ulna dist. Sin., NMNHS 12421 (Figure A16c). *Psilopogon javensis*. TL: 19.1. Measurements: thickness of diaphysis at the last papilla remigalis caudalis. *Jynx torquilla*: smaller papillae remigales caudales and blunter condylus ventralis ulnae. *Dendrocopos major*: longer condylus ventralis, smaller papillae and more sloping tuberculum carpale. *Psilopogon viridis*: dimensionally sharper tuber carpale and smaller papillae remigales caudales. *Psilopogon virens*: more proximal position of the last papilla. *Psilopogon asiaticus*: similar; longer condylus dorsalis in lateral view (measurement “c”). *Psilopogon oorti*: slightly larger; better developed tuberculum retinaculi. *Megalaima haemacephala*: much larger. *Psilopogon henricii*, *Psilopogon australis*, and *Calorhamphus fuliginosus*: larger or of similar size as the *Psilopogon oorti*, i.e., NMNHS 12421, which is considerably larger than these species (specimens not measured; after [6,26]; therefore, they were eliminated from our comparison. *Psilopogon franklini*:

slightly larger; more proximally positioned last papilla remigalis caudalis. *Psilopogon rafflesii*: similar; slightly smaller; condylus dorsalis more elongated in lateral view. *Psilopogon henricii*: more proximally positioned last papilla remigalis caudalis. *Psilopogon mystacophanos*: better developed papillae remigales caudales; condylus dorsalis more elongated in the lateral view. *Psilopogon australis*: much larger. *Psilopogon javensis*: completely identified, both in morphology and size (Table 72; Figure A7j).

Table 71. Measurements of humerus of fossil and recent Apodidae (a—length; b—thickness of caput humeri; c—width of distal epiphysis).

Species	a	b	c
Fossil—Dieu			
aff. <i>Hirundapus giganteus</i> NMNHS 12569	15.6	2.7	5.6
Recent			
<i>Tachymarptis melba</i> NHMT 1927.12.27.128	16.2	2.7	6.5
<i>Tachymarptis melba</i> NHMT 1927.12.27.43	16.0	2.3	6.6
<i>Apus apus</i> NHMT 1983.45.1	10.3	1.1	5.2
<i>Apus affinis</i> NHMT 1976.43.11	10.4	1.6	4.1
<i>Apus pacificus</i> NHMT 1887.8.178	11.7	1.7	4.9
<i>Hemiprocne comata</i> NHMT 1974.25.6	14.0	11.6	3.9
<i>Chaetura pelagica</i> NHMT 1902.2.2.3	9.3	1.7	3.8
<i>Collocalia esculenta</i> NHMT 1977.10.2	5.0	1.0	2.6

Table 72. Measurements of ulna dist. of fossil and recent Picinae (Ref. to Figure A7j).

Species	a	b	c	d	e
Fossil—Dieu					
<i>Psilopogon javensis</i> NMNHS 12421	2.2	2.5	4.1	3.4	3.6
Recent					
<i>Psilopogon javensis</i> NHMT 1850.8.15.67	2.0	2.7	4.2	3.5	3.1
<i>Psilopogon australis</i> NHMT 1969.1.61	1.2	2.0	2.8	2.4	2.5
<i>Psilopogon mystacophanos</i> NHMT 1850.8.97	ca. 1.6	2.1	4.0	3.1	3.5
<i>Psilopogon rafflesii</i> NHMT 1969.1.56	1.1	1.8	3.0	2.5	2.4
<i>Psilopogon henricii</i> NHMT 1969.1.58	1.1	2.3	3.3	2.8	3.4
<i>Psilopogon haemacephalus</i> NHMT 1850.8.15.75	2.2	2.7	5.2	4.1	ca. 3.9
<i>Psilopogon oorti</i> NHMT 1969.1.56	1.5	2.0	3.6	2.8	2.7
<i>Psilopogon virens</i> UCBL	1.8	3.1	5.9	4.5	4.4
<i>Psilopogon asiaticus</i> NMNHS 1891.7.20.48	1.7	2.3	3.8	3.0	3.4
<i>Psilopogon franklini</i> NHMT 1969.1.54	1.0	2.4	3.3	3.0	2.7
<i>Psilopogon asiaticus</i> UCBL	1.8	2.2	4.0	3.2	3.2
<i>Dendrocopos major</i> UCBL 270/1	1.8	2.4	4.3	3.7	3.4
<i>Dendrocopos major</i> UCBL 270/10	2.0	2.7	4.4	3.7	3.6
<i>Picus viridis</i> UCBL 268/2	2.0	3.1	5.6	4.8	4.4

Psilopogon haemacephalus (Statius Muller, 1776) Coppersmith Barbet

This is a resident of the Indian subcontinent, SW China, Sumatra, Java, Bali, and the Philippines. It is a common resident (except W, E Tonkin) [7] (Supplementary Materials, Map 31). IUCN—LC. Tbt. dist. dex., NMNHS 12422 (Figure A16d) *Psilopogon haemacephalus*. Dieu. TL: 14.4. *Dendrocopos*: more proximal position of the pricklet and more upright shaft of the diaphysis. *Psilopogon viridis*: metrical and deeper sulcus extensorius. *Jynx torquilla*: relatively longer p. stn. of the more upright diaphysis and thinner condylus lateralis. *Psilopogon virens*: size and relatively smaller diameter of the condylus med. *Psilopogon asiaticus*: metrical and deeper sulcus extensorius. *Psilopogon oorti*: considerably smaller. Shallower sulcus extensorius. *Psilopogon franklinii*: considerably smaller. *Psilopogon haemacephalus*: no differences and complete resemblance, both in morphology and size (Table 73; Figure A8a).

Table 73. Measurements of tbt. dist. of fossil and recent Picinae (Ref. to Figure A8a).

Species	a	b	c	d
Fossil—Dieu				
<i>Psilopogon haemacephalus</i> NMNHS 12422	2.1	3.1	3.2	3.0
Recent				
<i>Psilopogon haemacephalus</i> NHMT 1959.1.1	2.1	3.1	3.2	2.9
<i>Psilopogon haemacephalus</i> NHMT 1982.91.5	2.2	2.9	3.3	2.8
<i>Psilopogon haemacephalus</i> NHMT 1989.25.48	1.7	ca.2.9	3.1	2.7
<i>Psilopogon haemacephalus</i> NHMT 1966.8.2	2.1	3.1	2.8	3.3
<i>Psilopogon oorti</i> NHMT 1969.1.57	2.7	4.0	4.0	4.4
<i>Psilopogon franklinii</i> NHMT 1969.1.54	2.4	4.1	4.0	4.2
<i>Psilopogon virens</i> UCBL	3.8	6.1	5.8	6.6
<i>Psilopogon asiaticus</i> UCBL	3.0	4.4	3.9	4.5
<i>Dendrocopos major</i> UCBL 270/1	3.0	4.0	3.4	3.7
<i>Dendrocopos major</i> UCBL 270/10	2.8	4.0	3.2	3.8
<i>Picus viridis</i> UCBL 268/2	3.6	5.1	4.4	5.0
<i>Jynx torquilla</i> UCBL 277/3	2.2	3.0	2.6	2.8

3.9.2. Picidae Leach, 1820

Dendrocopos darjellensis (Blyth, 1845) Darjeeling Woodpecker

This is a resident of Nepal, Buthan, NE India, S, SE Tibet, SW, and W China. It is an uncommon resident of W, N Myanmar, and north W Tonkin [7] (Supplementary Materials, Map 32). IUCN—LC. Mandibula, rostral part, NMNHS 12448 (Figure A16e,f) *Dendrocopos darjellensis*. Dieu. TL: 18.1. The fragment shows general features of symphyseal parts of the mandible of woodpeckers—massive symphysis and a wide U-shape profile of the caudal view. *Dendrocopos martius*: much smaller. *Dendrocopos major*, *Picus viridis*, and *Jynx torquilla*: wider symphysis. *Sasia* and *Picumnus*: much larger. *Picoides tridactylus*: shorter symphysis. *Picus mentalis*: more robust; twice longer symphysis. *Picus chlorolophus*: similar, but the symphysis is shorter. *Picus puniceus*: much larger and robust; the symphysis is much longer. *Dendrocopos macei*: much larger. *Dendrocopos darjellensis*: complete similarity (Table 74; Figure A8b).

Table 74. Measurements of mandibula, rostrum of fossil, and recent Picinae (Ref. to Figure A8b).

Species	a	b
	Length of Symphysal Part	Thicknes in the Base of Symphysys
Fossil—Dieu		
<i>Dendrocopos darjellensis</i> NMNHS 12448	ca. 15.3	2.9
<i>Dendrocopos darjellensis</i> NMNHS 12449	ca. 14.2	2.6
Recent		
<i>Dendrocopos darjellensis</i> NHMT 1952.2.582	ca. 15.4	ca. 3.0
<i>Dendrocopos major</i> UCBL 270/1	12.0	2.8
<i>Dendrocopos major</i> UCBL 270/10	11.4	2.7
<i>Dendrocopos macei</i> NHMT 1850.15.150	ca. 11.6	ca. 2.6
<i>Picus puniceus</i> NHMT 1850.8.15.25	6.2	2.2
<i>Picus viridis</i> NHMT 1982.5.1	ca. 13.4	ca. 3.2
<i>Picus viridis</i> UCBL 268/2	ca. 10.3	2.6
<i>Picus mentalis</i> NHMT 1969.1.66	9.0	3.1
<i>Picus chlorolophus</i> NHMT 1845.1.12.258	ca. 12.4	ca. 3.2
<i>Picoides tridactylus</i> NHMT 1859.10.23.4	ca. 16.6	2.7
<i>Picoides tridactylus</i> NHMT 1985. 89.1	ca. 15.0	ca. 2.7
<i>Picoides tridactylus</i> NHMT 1898.5.7.24	ca. 12.4	-
<i>Dendrocopos martius</i> NHMT 1855.4.4.10	23.5	4.8
<i>Jynx torquilla</i> UCBL 277/3	3.4	1.3

Mandibula, rostral part, NMNHS 12449 (Figure A16g,h) *Dendrocopos darjellensis*. Dieu. TL: 16.8. The fragment shows general features of symphysal parts of the mandible of woodpeckers—massive syphysis and a wide U-shape profile of the caudal view. *Dendrocopos martius*: much smaller. *Dendrocopos major*, *Picus virirdis*, and *Jynx torquilla*: wider symphysis. *Sasia* and *Picumnus*: much larger. *Picoides tridactylus*: shorter symphysis. *Picus mentalis*: more robust; twice longer symphysis. *Picus chlorolophus*: similar, but the symphysis is shorter. *Picus puniceus*: much larger and robust; the symphysis is much longer. *Dendrocopos macei*: much larger. *Dendrocopos darjellensis*: complete similarity (Table 74).

3.9.3. Picinae gen. Indet.

Cmc prox. dex., NMNHS 12419 (Figure A16i) Dieu. Picinae gen. indet. TL: 18.6. This finding bears the features of Picidae and is dimensionally close to *Picus viridis*. It differs from that species in that it has a shorter processus extensorius, smaller pr. intermetacarpalis, and a wider base of the pr. extensorius in the cranial view. The *Dendrocopos major* has smaller sizes, longer prox. extensorius, and rounder tr. metacarpalis. This finding remained uncompered with specimens of the following species that are spread in the SE Asia: *Picus vittatus*, *Picus canus*, *Picus rabieri*, *Picus erythropygius*, *Picus flavinucha*, *Gecinulus viridis*, *Blythipicus pyrrhotis*, and *Chrysocolaptes lucidus* (Table 75; Figure A8c).

Table 75. Measurements of cmc. dex. prox. of fossil and recent Picinae (Ref. to Figure A8c).

Species	a	b	c
Fossil—Dieu			
Picinae gen. NMNHS 12419	3.45	4.1	3.6
Recent			
<i>Picus viridis</i> UCBL 268/4	2.9	3.5	3.2
<i>Picus viridis</i> UCBL 268/7	3.4	3.4	3.65
<i>Dendrocopos major</i> UCBL 270/5	2.1	2.76	2.6

3.10. Passeriformes Linnaeus, 1758

3.10.1. Oriolidae Vigors, 1825

Oriolus chinensis Linnaeus, 1766 (Black-Naped Oriole)

This is a resident of Andaman and Nicobar Is, Taiwan, Greater Sundas, W Lesser Sundas, Philippines, Sulawesi, Sula Is, and N Moluccas (Mayu). It breeds in China (except NW), SE Siberia, Ussuriland, and N, S Korea; its northern population winters in the south, C, S, NE India, Bangladesh, and S China. It is an uncommon to common resident of SW Myanmar, extreme S Thailand, Peninsular Malaysia, Singapore, W, E Tonkin, and N Annam [7] (Supplementary Materials, Map 33). IUCN—LC. Cmc dist. dex., NMNHS 12445 (Figure A16j,k) *Oriolus chinensis*. TL—12.9. *Oriolus xanthonotus*: similar in morphology; bigger. *Oriolus oriolus*: shorter synostosis metacarpalis distalis. *Oriolus chinensis*: complete identity in size and morphology (Table 76; Figure A8d).

Table 76. Measurements of cmc dist. of fossil and recent Oriolidae (Ref. to Figure A8d).

Species	a	b	c
Fossil—Dieu			
<i>Oriolus xanthonotus</i> NMNHS 12445	1.8	2.4	2.1
Recent			
<i>Oriolus chinensis</i> NHMT 1891.7.20.205	1.7	2.5	2.0
<i>Oriolus chinensis</i> NHMT 1850.8.15.104	ca. 1.9	-	ca. 2.2
<i>Oriolus oriolus</i> NHMT 1968.6.10	1.9	2.4	2.2
<i>Oriolus oriolus</i> NHMT 1968.6.9	-	2.1	2.4
<i>Oriolus xanthonotus</i> NHMT 1969.1.166	1.4	1.9	1.7

3.10.2. Dicruridae Vigors, 1825

Dicrurus Vieillot, 1816 sp. (Drongo)

Tmt sin. NMNHS 12459 (Figure A16l,m) *Dicrurus* sp. Approximative total length of the bone (i.e., total length of tarsus, which can be consulted with many sources (tarsus length—31.0). This finding represents almost the whole bone, and only the proximal epiphysis is missing. It shows the specific features for Dicruridae. Their tmt-I on the caudal side very long, and the deep articular inception for the phalanx prox. dig. 1 pedis. *Dicrurus hottentottus* is bigger and more robust. *Dicrurus remifer*: much bigger. *Dicrurus paradiseus*: bigger; thicker diaphysis. *Dicrurus adsimilis junior*: bigger and more robust. *Dicrurus sharpei*: much larger. *Dicrurus paradiseus*: bigger; thicker diaphysis, but some specimens (NHMT 1954. 5.6) seem to be of a similar size. The recent fauna of Vietnam includes seven species of drongos: *Dicrurus remifer*, *Dicrurus hottentottus*, *Dicrurus paradiseus*, *Dicrurus macrocerus*, *Dicrurus leucophaeus*, *Dicrurus annectans*, and *Dicrurus aeneus*. The first three have been excluded, but the specimen remained uncomparated with the remaining four species. Its considerable size excludes all smaller taxa (Table 77; Figure A8e).

Table 77. Measurements of the tmt of fossil and recent Dicruridae (Ref. to Figure A8e; c—thickness of tr. m.; d—TL of tmt;).

Species	a	b	c	d
Fossil—Dieu				
Dicruridae gen. NMNHS 12459	1.8	3.8	2.9	ca. 31.0
Recent				
<i>Dicrurus hottentottus</i> NHMT 1969.4.215	1.9	3.7	2.0	23.0
<i>Dicrurus hottentottus</i> NHMT 1961.11.25	-	ca. 2.9	ca. 2.4	ca. 21.4
<i>Dicrurus remifer</i> NHMT 1969.1.155	1.2	3.2	1.8	-
<i>Dicrurus remifer</i> NHMT 1969.1.156	0.9	2.4	1.4	19.2
<i>Dicrurus paradiseus</i> NHMT 1969.1.163	1.4	3.3	1.9	22.6
<i>Dicrurus paradiseus</i> NHMT 1969.1.164	1.1	2.9	1.9	22.4
<i>Dicrurus paradiseus</i> NHMT 1954. 5.6	-	-	-	ca. 27.0
<i>Dicrurus adsimilis junior</i> NHMT 1881.1.7.28	-	ca. 3.2	-	ca. 18.6
<i>Dicrurus sharpei</i> NHMT 1911.5.31.421	-	ca. 2.4	-	ca. 15.9

3.10.3. Corvidae Leach, 1820

Corvus corone Linnaeus, 1758 / *C. macrorhynchos* Wagler, 1827 (Carrion Crow / Large-Billed Crow)

Corvus corone: Mostly a resident of Palearctic, N Pakistan, NW India, W and northern China, N, S Korea, and Japan; some northern populations winter to the south, N Pakistan, NW India, and southern China. It is a vagrant of E Tonkin [7]. *Corvus macrorhynchos*: Resident of E Afganistan, Indian subcontinent, S, E Tibet, China (except NW), Taiwan, N, S Korea, SE Siberia, Ussuriland, Sakhalin I, Japan, Sundas, and the Philippines. It is an uncommon to common resident throughout [7] (Supplementary Materials, Map 34). Tbt. Dist. Dex., NMNHS 12320 *C. corone/macrorhynchos*. Dieu. The finding is fairly broken and only part of the distal epiphysis is preserved. It belongs to a large corvid of the Corvini tribe. Three species of g. *Corvus* at least are spread at present in the southernmost parts of S China by the border of N Vietnam, namely the House Crow (*Corvus splendens*), Carrion Crow (*Corvus corone*), and Large-billed Crow (*Corvus macrorhynchos*), as well as the Daurian Jakdaw (*Coloeus dauuricus*) [26]. Nevertheless, the bad preservation, as the diagnostic for the passerines edgelet on the middle of the sulcus cartilagini tibialis, is well preserved. The larger size refers the finding to Corvini. *Corvus frugilegus*, *Corvus splendens*, *Coloeus monedula*, *Coloeus dauuricus*, *Pyrrhocorax graculus*, *Pyrrhocorax pyrrhocorax*, and *Nucifraga caryocatactes*: larger. *Corvus corax*: smaller. *Corvus corone* and *Corvus macrorhynchos*: of the same size and similar in general, but differs by the even, not protruded medial edge on the sulcus cartilagini tibialis (Table 78; Figure A8f).

Corvus Linnaeus, 1758 sp. (Crow)

Humerus dist. dex., NMNHS 12513 (Figure A16n) *Corvus* sp. Dieu. Measurements. This finding presents a bone splinter of the lateral surface of the distal diaphysis immediately before the distal epiphysis. The fragment preserves the whole fossa musculus brachialis, whose shape is very typical in Passeriformes (i.e., Oscines). The large dimensions exclude all the SE-Asian families and suggests the Corvidae. The largest species of the region belongs to g. *Corvus*. The morphological comparison with crows also suggests that genus. The variety of crows and the small preserved part of the bone do not allow for further identification. Three species of g. *Corvus* are spread at present in Vietnam—*Corvus corone*, *Corvus macrorhynchos*, and *Corvus torquatus*. *Coloeus monedula*: bigger. *Corvus macrorhynchos*: similar in shape in size (Table 79; Figure A8g).

Table 78. Measurements of tbt. dist. ff fossil and recent Corvidae (Ref. to Figure A8f).

Species	a	b	c
Fossil—Dieu			
Corvidae gen. NMNHS 12320	ca. 8.7	3.8	6.7
Recent			
<i>Corvus macrorhynchus japonensis</i> NHMT 1969.6.11	8.7	3.8	7.8
<i>Corvus macrorhynchus culminatus</i> NHMT 1973.66.159	7.3	3.1	6.4
<i>Corvus macrorhynchus</i> NHMT 1969.1.168	8.6	3.8	7.7
<i>Corvus frugilegus</i> NHMT 1930.3.24.597	7.4	3.9	5.8
<i>Corvus frugilegus</i> NHMT 1990.11.1	7.5	2.7	2.9
<i>Coloeus monedula</i> NHMT 1990.11.5	5.9	1.9	4.2
<i>Corvus splendens protegatus</i> NHMT 1978.66.157	6.6	3.8	5.2
<i>Corvus splendens</i> NHMT 1973.66.154	5.8	1.9	4.4
<i>Corvus corone</i> NHMT 1876.3.1	8.3	3.6	7.3
<i>Corvus corone</i> NHMT 1990.11.4	7.5	3.2	6.3
<i>Corvus corax</i> NHMT 1862.12.26.4	10.9	5.1	10.4
<i>Corvus corax</i> NHMT 1850.5.19.5	12.2	5.3	10.5
<i>Pyrrhocorax pyrrhocorax</i> NHMT 1983.100.1	6.4	2.4	5.4
<i>Pyrrhocorax graculus</i> NHMT 1986.1.14	5.8	2.3	4.6
<i>Nucifraga caryocatactes</i> NHMT 1924.5.31.238	5.4	2.1	4.6

Table 79. Measurements of humerus dist. of fossil and recent Corvidae (Ref. to Figure A8g).

Species	a	b
Fossil—Dieu		
<i>Corvus</i> sp. NMNHS 12513	2.4	8.8
Recent		
<i>Coloeus monedula</i> NHMT 1990.11.5	2.0	5.5
<i>Corvus splendens protegatus</i> NHMT 1978.66.157	ca. 1.8	4.8
<i>Corvus splendens</i> NHMT 1850.8.15.78	2.4	6.4
<i>Corvus splendens</i> NHMT 1973.66.154	1.9	5.7
<i>Corvus macrorhynchus japonensis</i> NHMT 1969.6.11	3.4	9.3
<i>Corvus macrorhynchus</i> NHMT 1969.1.168	2.9	7.0
<i>Corvus macrorhynchus</i> NHMT 1973.66.159	2.4	5.7
<i>Corvus corone</i> NHMT 1992.4.1	3.0	6.4
<i>Corvus corone</i> NHMT 1974.10.4	3.0	6.8
<i>Corvus corone</i> NHMT 1982.142.1	2.7	7.8
<i>Corvus corax</i> NHMT 1862.12.26.4	4.6	11.7

***Cissa chinensis* (Boddaert, 1783) Common Green Magpie**

Cissa chinensis: Resident of N, NE Indian subcontinent, SW China Sumatra, and Borneo. It is a common resident (except Singapore, C, SE, S Thailand, Cambodia, Cochinchina) [7] (Supplementary Materials, Map 35). IUCN—LC. Humerus sin. NMNHS 12343 (Figure A16o) *Cissa* cf. *chinensis*. Dieu. *Acridotheres tristis*: smaller. *Oriolus chinensis*: Besides the sediment coating of epiphyses, the general shape of the whole bone is similar, but the diaphysis is

slightly longer. *Cyanopica cyanus*: bigger. *Cissa thalassina*: very similar, both in size and proportions. *Cissa chinensis*: completely identity (Table 80).

Table 80. Measurements of humerus of fossil and recent *Cissa* (a—length from tub. ventr. to proc. flex.; b—height of tub. ventr.; c—min. width of diaphysis; d—width of distal ending epicondylus).

Species	a	b	c	d
Fossil—Dieu				
<i>Cissa</i> cf. <i>chinensis</i> NMNHS 12343	ca. 33.0	4.8	3.2	ca. 8.4
Recent				
<i>Cissa chinensis</i> NHMT 2003.13.1	33.2	5.3	3.1	9.4
<i>Cissa thalassina</i> NHMT 2000.11.3	30.8	5.1	3.2	8.2
<i>Cissa chinensis</i> NHMT 2003.13.1	33.2	5.3	3.1	9.4
<i>Cyanopica cyanus</i> NHMT 1986.1.13	28.0	4.7	2.9	7.8
<i>Cyanopica cyanus</i> NHMT 2002.7.1	28.9	5.5	2.9	7.4
<i>Acridotheres tristis</i> NHMT 1957.15.9	33.3	5.2	3.2	8.6
<i>Oriolus chinensis</i> NHMT 1891.7.20.205	30.1	4.7	3.0	7.4

Ulna dist. dex., NMNHS 12401 (Figure A16p,q) *Cissa thalassina*. Dieu. TL: 21.4. *Garrulus glandarius*: similar in size; smaller distances between papillae remigales caudales, less developed papillae remigales caudales, and the absence of the toothlet on the dorso-cranial surface of the distal end of the diaphysis or its lesser development. *Dendrocittavagabunda*: thicker diaphysis; deeper sulcus radialis; straight, not slightly bent diaphysis in its distal fourth. *Corvus* and *Pyrrhocorax*: much smaller. *Cyanopica cyanus*: much smaller; less developed papillae remigales caudales. *Cissa thalassina*: very similar. *Cissa chinensis*: completely identity (Table 81; Figure A8h).

Table 81. Measurements of ulna of fossil and recent Corvidae (Ref. to Figure A8h).

Species	a	b	c
Fossil—Dieu			
<i>Cissa thalassina</i> NMNHS 12401	4.0	5.0	3.6
Recent			
<i>Cissa thalassina</i> NHMT 1846.5.5.24	4.0	4.9	3.5
<i>Cissa chinensis</i> NMNHW 347348	3.6	4.9	3.5
<i>Garrulus glandarius</i> UCBL 303/19	4.5	5.3	4.3
<i>Cyanopica cyanus</i> NHMT 1986.1.13	3.1	3.2	3.4
<i>Dendrocitta vagabunda</i> NHMT 1868.9.12.29	3.8	5.0	3.9
<i>Coloeus monedula</i> NMNHS			
<i>Pyrrhocorax graculus</i> NMNHS			
<i>Pyrrhocorax pyrrhocorax</i> NMNHS			
<i>Pica pica</i> UCBL 300/11	4.8	6.0	4.3

Corvidae gen. (*Dendrocitta*/*Crypsirina*/*Temnurus*) Treepie

Mandibula prox. dex., NMNHS 12403 (Figure A16r,s) Corvidae gen., Dieu. TL: 26.4. Measurements: a—length of proximal part up to the curve of the margo tomialis; c—at the narrower part of the proximal half; d—thickness at the same place.

It is a smaller corvid. The pr. mandibulae of the articular part is missing. *Garrulus glandarius*: similar in size; much smaller fenestra caudalis mandibularis; blunt pr. coronoideus; much

smaller articular part. *P. pica*: similar in size; much smaller fenestra caudalis mandibularis. *Cissa chinensis*: smaller fenestra caudalis mandibularis; presence of the pricklet; narrower rhamus mandibulae (measurement “b”). *Cissa thalassina*: slightly smaller; smaller fenestra caudalis mandibularis. *Nucifraga caryocatactes*, *Urocissa erythrorhyncha*, *Urocissa caerulea*, *Urocissa ornata*, and *Dendrocitta vagabunda*: narrower mandibula in the proximal part (measurement “c”); smaller fenestra caudalis mandibularis. *Cyanopica cyanus*: wider rhamus mandibulae (measurement “c”); *Pyrrhonorax graculus* and *Pyrrhonorax pyrrhonorax*: similar in size; thicker mandibula (measurement “d”); smaller fenestra caudalis mandibularis. *Dendrocitta formosae*: smaller; narrower rhamus mandibulae (measurements “b” and “c”). To be compared with: *D. frontalis*, *Crypsirina temia*, and *Temnurus temnurus* (Table 82; Figure A8i).

Table 82. Measurements of mandibula prox. of fossil and recent Corvidae (Ref. to Figure A8i).

Species	a	b	c	d
Fossil—Dieu				
Corvidae gen. NMNHS 12403	19.7	4.6	4.4	1.5
Recent				
<i>Garrulus glandarius</i> UCBL 303/19	26.8	5.1	5.4	1.0
<i>Pica pica</i> UCBL 300/11	24.7	5.2	5.3	1.5
<i>Cissa thalassina</i> NHMT 1846.5.5.24	ca. 24.2	5.8	5.9	1.3
<i>Cissa thalassina</i> NHMT 2000.11.3	21.9	4.3	5.5	1.7
<i>Cissa chinensis</i> NMNHW 347348	ca. 23.4	5.0	4.8	1.4
<i>Cissa chinensis</i> NHMT 2003.13.1	23.0	5.4	5.4	1.4
<i>Cyanopica cyanus</i> NHMT 1986.1.13	21.2	3.6	-	0.8
<i>Dendrocitta formosae</i> NHMT 1896.2.16.96	27.8	5.7	7.0	1.2
<i>Dendrocitta vagabunda</i> NHMT 1868.9.12.29	22.0	4.7	5.2	1.5
<i>Coloeus monedula</i> NHMT 1930.3.24.612	28.9	5.6	6.2	1.3
<i>Urocissa erythrorhyncha</i> NHMT 1990.17.26	25.5	5.6	5.8	1.4
<i>Urocissa caerulea</i> NHMT 1895.52.15	27.2	6.0	6.3	1.3
<i>Urocissa ornata</i> NHMT 1993.37.1	25.4	5.6	6.6	1.5
<i>Nucifraga caryocatactes</i> NHMT 1924.5.31.238	29.6	6.0	5.8	1.5
<i>Pyrrhonorax graculus</i> NHMT 1953.26.5	26.0	4.0	4.2	1.2
<i>Pyrrhonorax pyrrhonorax</i> NHMT1983.100.1	30.3	4.2	4.8	1.2

3.10.4. Leiothrichidae Swainson, 1831 Laughing Thrushes

Trochalopteron cf. *milnei* (David, 1874) Red-tailed Laughing Thrush

This is a resident of Southern China. It is a sScarce to uncommon resident of N, E Myanmar, NW Thailand, Laos, W, E Tonkin, N, and C Annam [7]. 9 (Supplementary Materials, Map 36). IUCN—LC. Scapula prox. dex., NMNHS 12440 (Figure A16t) TL: 9.7. *Trochalopteron* cf. *milnei*. The F. art. clavicularis and corpus scapulae are damaged. *Garrulax mitratus*: similar in general morphology and size (Table 83; Figure A3e); slightly bigger. *Trochalopteron erythrocephalum* and *Garrulax rufogularis*: similar; medial articular part (measurement “b”) relatively broader. *Garrulax sannio*: f. a. humeralis more oval. *Trochalopteron milnei*: complete similarity.

Table 83. Measurements of scapula prox. of fossil and recent Leiothrichidae (Ref. to Figure A9a).

Species	a	b	c
Fossil—Dieu			
<i>Trochalopteron</i> cf. <i>milnei</i> NMNHS 12440	1.8	2.3	4.4
Recent			
<i>Trochalopteron milnei</i> NHMT 2000.14.2	1.8	2.5	5.1
<i>Garrulax mitratus</i> NHMT 1969.1.338	1.5	1.9	3.6
<i>Garrulax mitratus</i> NHMT 1969.1.340	1.5	2.0	4.0
<i>Garrulax erythrocephalus</i> NHMT 1989.19.8	1.6	1.9	4.0
<i>Garrulax erythrocephalus</i> NHMT 1969.1.345	2.1	2.6	4.8
<i>Garrulax rufogularis</i> NHMT 1965.15.3	1.3	1.7	3.8
<i>Garrulax rufogularis</i> NHMT 1972.1.120	1.3	2.1	3.8
<i>Garrulax sannio</i> NHMT 1993.1.17	1.8	2.3	ca. 4.2

3.10.5. Cinclidae Borkhausen, 1797

Cinclus aff. *pallasii* Temminck, 1820 Brown Dipper

Cinclus pallasii: Resident, subject to some movements, formerly of Soviet C Asia, E Palearctic, NE Afganistan, N Pakistan, NW, N, NE Indian subcontinent, S, E Tibet, China, Taiwan, N, S Korea, and Japan. It is an uncommon resident of W, N, E Myanmar, N, C Laos, W Tonkin, and N Annam. Recorded (status uncertain) in NW Thailand [7] (Supplementary Materials, Map 37). IUCN—LC. Ulna prox. dex., NMNHS 12384 (Figure A16u). *Cinclus* aff. *pallasii*. Dieu. TL: 22.7

This finding preserves the specific wider prox. epiphysis and its slightly flattened lat. surface. *Turdus merula*: smaller; shorter cotyla dorsalis. *Turdus poliocephalus* and *Turdus olivaceus*: similar in size; cotyla dorsalis rounded, not cut. The rounded cotyla dorsalis distinguishes NMNHS 12384 from Turdidae. *Cinclus cinclus*: very similar, but slightly more developed papillae remigales caudales; more robust; slightly bigger (Table 84; Figure A9b).

Table 84. Measurements of ulna prox. of fossil and recent *Cinclus* and *Turdus* (Ref. to Figure A9b).

Species	a	b	c
Fossil—Dieu			
<i>Cinclus</i> sp. (aff. <i>pallasii</i>) NMNHS 12384	4.7	3.3	2.4
Recent			
<i>Cinclus cinclus</i> NHMT 1988.33.1	4.4	2.9	2.4
<i>Cinclus cinclus</i> NHMT 1859.9.6.423	4.3	2.7	2.5
<i>Cinclus cinclus</i> NHMT 1988.73.1	4.1	2.5	2.4
<i>Cinclus cinclus</i> NHMT 1991.23.1	4.1	2.5	2.5
<i>Cinclus cinclus</i> NHMT 1860.2.21.2	4.4	2.9	2.6
<i>Cinclus cinclus</i> NHMT 1930.3.24.384	4.3	2.7	2.5
<i>Cinclus cinclus</i> NHMT 1896. 8.1.2	4.1	2.7	2.2
<i>Turdus iliacus</i> NHMT 1982.28.6	4.3	2.9	2.5
<i>Turdus iliacus</i> NHMT 1989.11.10	5.3	2.7	2.4
<i>Turdus iliacus</i> NHMT 1987.11.7	4.4	3.1	2.3

Table 84. *Cont.*

Species	a	b	c
<i>Turdus merula</i> NHMT 1973.45.1	5.1	3.4	3.0
<i>Turdus pilaris</i> NHMT 1998.56.1	5.5	3.5	2.9
<i>Turdus poliocephalus</i> NHMT 1975.3.7	4.1	2.9	2.3
<i>Turdus olivaceus</i> NHMT 1977.8.62	4.4	2.8	2.4
<i>Turdus philomelos</i> UCBL 330/1	4.4	2.9	2.4
<i>Turdus philomelos</i> UCBL 330/2	4.5	2.8	2.5
<i>Monticola solitarius</i> NHMT 1860.7.22.17	4.5	2.9	2.5

3.10.6. Turdidae Rafinesque, 1815

Turdus iliacus Linneus, 1758 Redwing

Is not listed by [7]. It is in Iceland, Faroe Is to W, N and S Europe, N Siberia, N Africa, and SW Asia (DICKINSON 2003) (Supplementary Materials, Map 38). IUCN—NT. Ulna prox. sin., NMNHS 12425 *Turdus iliacus*. (Figure A17j,k). Dieu. TL: 19.3. *Monticola solitarius*: the distal fourth of the diaphysis is more dorso-laterally curved. *Turdus merula*: similar in size and general morphology; slightly thinner diaphysis; shorter and sharper olecranon in the ventral view of *Turdus pilaris*: thinner diaphysis; shorter and sharper olecranon in ventral view. *Turdus poliocephalus*: thicker diaphysis; more robust prox. epiphysis; more longitudinally directed olecranon ulnae. *Turdus olivaceus*: similar; shallower sulcus tendineus musculus flexorii carpi ulnaris. *Turdus philomelos*: thicker olecranon. *Turdus iliacus*: completely identity The Redwing is a rare, occasional wintering thrush, which breeds in N Europe and Siberia, but in E Asia in winter it reaches the Altai Mts and NW of Xinjiang in NE China [26]. It seems that in the Late Pleistocene its eruptive appearances in the south have been much longer (Table 85; Figure A9b).

Table 85. Measurements of ulna prox. of fossil and recent *Turdus* (Ref. to Figure A9b).

Species	a	b	c
Fossil—Dieu			
<i>Turdus iliacus</i> NMNHS 12425	4.8	3.0	2.3
Recent			
<i>Turdus iliacus</i> NHMT 1982.28.6	4.3	2.9	2.5
<i>Turdus iliacus</i> NHMT 1989.11.10	5.3	2.7	2.4
<i>Turdus iliacus</i> NHMT 1987.11.7	4.4	3.1	2.3
<i>Turdus merula</i> NHMT 1973.45.1	5.1	3.4	3.0
<i>Turdus pilaris</i> NHMT 1998.56.1	5.5	3.5	2.9
<i>Turdus poliocephalus</i> NHMT 1975.3.7	4.1	2.9	2.3
<i>Turdus olivaceus</i> NHMT 1977.8.62	4.4	2.8	2.4
<i>Turdus philomelos</i> UCBL 330/1	4.4	2.9	2.4
<i>Turdus philomelos</i> UCBL 330/2	4.5	2.8	2.5
<i>Monticola solitarius</i> NHMT 1860.7.22.17	4.5	2.9	2.5

Turdus pilaris Linnaeus, 1758 Fieldfare

Is not listed by [7]. N an C Europe, W and C Siberia to Aldan basin and Transbaikalia, N Asia to W and S Europe, and SW Asia (Dickinson, 2003) (Supplementary Materials, Map 39). IUCN—LC. Tbt. dist. dex., NMNHS 12447 (Figure A16v) *Turdus pilaris*. Dieu. TL: 9.5. *Geokichla interpres*: thicker diaphysis. *Turdus viscivorus*: slightly smaller; thinner diaphysis

in its distal end. *Myophonus temminckii*: much larger. *Turdus iliacus*, *Turdus philomelos*, and *Geokichla cyanotus*: larger. *Monticola olitaries*: bigger distal epiphysis. *Turdus pelios*: relatively wider distal epiphysis (measurement “a”). *Turdus poliocephalus*: wider distal epiphysis. *Turdus merula*: similar in size and general morphology; longer transverse diameter of the condylus medialis. *Turdus pilaris*: identical (Table 86; Figure A9c).

Table 86. Measurements of tbt. dist. ff fossil and recent *Turdus* (Ref. to Figure A9c).

Species	a	b	c	d
Fossil—Dieu				
<i>Turdus pilaris</i> NMNHS 12447	4.6	ca. 3.5	4.2	4.3
Recent				
<i>Turdus pilaris</i> NHMT 1998.56.1	4.6	3.3	4.2	4.2
<i>Turdus pilaris</i> NHMT 1980.3.1	4.3	3.2	4.2	4.4
<i>Turdus pilaris</i> NHMT 1977.22.1	4.5	3.8	4.3	4.5
<i>Myophonus temminckii</i> (<i>Myophonus caeruleus temminckii</i>) NHMT 1933.11.16.32	5.7	4.2	5.8	6.2
<i>Myophonus glaucinus</i> NHMT 1846.5.5.12				
<i>Turdus poliocephalus tempesti</i> NHMT 1975.3.7	3.8	2.6	3.8	3.8
<i>Turdus viscivorus</i> NHMT 1985.41.5	4.6	3.0	4.3	4.6
<i>Turdus merula</i> NHMT 1973.45.1	4.4	3.3	4.1	4.2
<i>Turdus iliacus</i> NHMT 1985.11.7	3.5	2.4	3.4	3.5
<i>Turdus philomelos</i> NHMT 1981.89.3	3.6	2.7	3.6	3.5
<i>Turdus olivaceus pelios</i> NHMT 1977.8.62	3.8	2.6	3.8	3.6
<i>Geokichla citrina cyanotus</i> NHMT 1972.1.113	3.6	5.4	3.3	3.6
<i>Geokichla interpres</i> NHMT 1850.8.15.144	3.9	3.1	3.4	3.9
<i>Monticola solitarius</i> NHMT 1860.7.22.17	3.6	2.6	3.5	3.6

Turdus aff. *merula* Linnaeus, 1758 Common Blackbird

Turdus merula: Breeds in N Africa, W Palearctic, Middle East, former C Soviet Asia, Afghanistan, N Pakistan, N and peninsular India, Nepal, Sri Lanka, S, SE Tibet, and China (except N and NE); some northern populations winter in the south, N Africa, and the N Indian subcontinent. They were introduced in Australia and New Zealand. They are scarce to common winter visitors of Laos, W, E Tonkin, N, and C Annam. In addition, they are also recorded on passage to E Tonkin. They are vagrants of NE Thailand and north Cambodia [7] (Supplementary Materials, Map 40). IUCN—LC.

Ulna dist. sin., NMNHS 12508 (Figure A17g–i) *Turdus* aff. *merula*. TL—4.5. Only the distal epiphysis is preserved. All morphological features could be traced on the preserved fragment. *Monticola solitarius*: more developed tub. retinaculi. *Geokichla citrina*: lesser tr. retinaculi. *Turdus iliacus*: less developed tub. retinaculi. *Turdus philomelos*: very similar; slightly smaller tub. retinaculi. *Turdus merula*: completely identified (Table 87; Figure A6g).

3.10.7. Sturnidae Rafinesque, 1815

Acridotheres tristis (Linnaeus, 1766) Common Myna

This is a resident of former Soviet C Asia, SE Iran, Afghanistan, Indian subcontinent, and SW China. They were introduced in S Africa, Middle East, S China (Hong Kong), Sumatra, Borneo (Brunei), Australia, New Zealand, and many islands in tropical and subtropical oceans worldwide. It is a common resident throughout [7] (Supplementary Materials, Map 41). IUCN—LC.

Table 87. Measurements of ulna dist. of fossil and recent Turdidae (Ref. to Figure A6g).

Species	a	b	c
Fossil—Dieu			
<i>Turdus</i> aff. <i>merula</i> NMNHS 12508	2.2	3.1	ca. 2.3
Recent			
<i>Turdus merula</i> NHMT 1996.61.1	2.6	3.0	2.4
<i>Turdus merula</i> NHMT 1988. 24.1	2.8	3.3	2.6
<i>Turdus merula</i> NHMT 1982.134.1	2.9	3.4	2.8
<i>Turdus merula</i> NHMT 1983. 8.2	2.8	3.3	2.6
<i>Turdus philomelos</i> NHMT 1985.51.1	2.1	2.9	2.4
<i>Turdus philomelos</i> NHMT 1979.22.3	2.5	3.0	2.4
<i>Turdus philomelos</i> NHMT 1982.29.2	2.7	2.3	2.2
<i>Turdus philomelos</i> NHMT 1981.51.1	2.6	3.0	2.1
<i>Turdus iliacus</i> NHMT 1982.46.2.	2.4	2.9	2.0
<i>Monticola solitarius</i> NHMT 1859.4.7.5	2.6	2.9	2.4
<i>Geokichla citrina</i> NHMT 2003. 4.8	2.5	3.0	2.2

Ulna dist. dex., NMNHS 12402 *Acridotheres tristis*. (Figure A16w). Dieu. TL: 17.8. *G. glandarius*: similar in size; smaller distances between papillae remigales caudales with less developed papillae remigales caudales and the absence of the toothlet on the dorso-cranial surface of the distal end of diaphysis or its lesser development. *C. chinensis*: very similar. *Cissa thalassina*: completely identity. *Cyanopica cyanus*: much smaller; less developed papillae remigales caudales. *Dendrocitta vagabunda*: thicker diaphysis; deeper sulcus radialis; straight, not slightly bent diaphysis in its distal fourth. *Corvus* and *Pyrrhocorax*: much smaller. *Gracupica nigricollis*: Almost identical in size and morphology; diaphysis more smooth on the diaphysis surface of the diaphysis end. *Ampeliceps coronatus*: Slightly larger; more stight diaphysys; bigger condylus dorsalis in lat. view. *Acridotheres javanicus*: slightly smaller; less protruding condylus dorsalis in the caud. view. *Acridotheres tristis*: complete identity (Table 88; Figure A4f).

Table 88. Measurements of ulna of fossil and recent Sturnidae (Ref. to Figure A4f).

Species	a	b	c
Fossil—Dieu			
<i>Acridotheres tristis</i> NMNHS 12402	4.0	5.0	3.6
Recent			
<i>Acridotheres tristis</i> NHMT 1957.15.9	4.0	4.8	3.5
<i>Acridotheres javanicus</i> NHMT 1891.7.20.179	3.6	4.3	3.3
<i>Acridotheres fuscus</i> NHMT 1891.7.20.171	3.5	3.7	3.1
<i>Gracupica nigricollis</i> NHMT 1869.10.19.15	4.0	4.8	3.8
<i>Ampeliceps coronatus</i> NHMT 1983.1.1	3.6	3.2	3.0
<i>Cissa thalassina</i> NHMT 1846.5.5.24	4.0	4.9	3.5
<i>Cissa chinensis</i> NMNHW 347348	3.6	4.9	3.5

Acridotheres sp. (cf. *tristis*) Common Myna

This is a former resident of Soviet C Asia, SE Iran, Afganistan, Indian subcontinent, and SW China. It was introduced in S Africa, Middle East, S China (Hong Kong), Sumatra,

Borneo (Brunei), Australia, New Zealand, and many islands in tropical and subtropical oceans worldwide. It is a common resident throughout S and SE Asia [7].

Femur prox. sin., NMNHS 12457 *Acridotheres* sp. (cf. *tristis*) (Figure A16x). This finding is damaged and the endings of the trochanter femoris are not preserved. The general shape and details of the impressiones ilirotrochantherica and fovea ligamenti capitis indicate a specimen of Sturnidae. *Streptocitta albigollis torquata*: smaller; sharper edges. *Gracupica nigricollis*: similar in size, but the impressiones obturatoriae are deeper. *Sturnus vulgaris*: much bigger. *Acridotheres ginginianus*: slightly bigger; more robust; sharper outlined impressiones obturatoriae. *Acridotheres fuscus*: thicker column femoris. *Acridotheres tristis*: completely identified besides the fragmentary nature of the finding (Table 89; Figure A9d).

Table 89. Measurements of femur prox of fossil and recent Sturnidae (Ref. to Figure A9d).

Species	a	b	c
Fossil—Dieu			
<i>Acridotheres</i> sp. (cf. <i>tristis</i>) NMNHS 12457	2.6	2.4	2.5
Recent			
<i>Acridotheres tristis</i> NHMT 1957.15.9	2.7	2.6	2.3
<i>Acridotheres tristis</i> NHMT 1986.75.51	2.4	2.4	2.5
<i>Acridotheres tristis</i> NHMT 1986.75.53	2.5	2.5	2.2
<i>Acridotheres tristis</i> NHMT 1986.75.52	2.7	2.6	2.5
<i>Acridotheres tristis</i> NHMT 1957.15.9			
<i>Acridotheres ginginianus</i> NHMT 1993.7.3	2.0	2.1	2.1
<i>Acridotheres fuscus</i> NHMT 1991.1.47	2.4	2.4	2.5
<i>Gracupica nigricollis</i> NHMT 1869.10.19.15	2.4	2.8	2.7
<i>Sturnus vulgaris</i> NHMT 1985.84.1	2.0	2.1	1.9
<i>Streptocitta albigollis torquata</i> NHMT 1872.7.21.3	2.6	3.0	2.8

Acridotheres cf. *crisatellus* (Linnaeus, 1758) Golden-Crested Myna

This is a resident of C and southern China and Taiwan. It was introduced in Japan, Philippines (Manila), Canada (Vancouver), and Argentina. It is an uncommon to common resident of C, S Laos and Vietnam (except Cochinchina). It is recorded in E Myanmar. It is a scarce to local feral resident of peninsular Malaysia (PenangI and Kuala Lumpur), Singapore [7], and all of Vietnam (DEL HOYO 2016) (Supplementary Materials, Map 42). IUCN—LC.

Tbt. dist. sin., NMNHS 12499 (Figure A17a,b) *Acridotheres* cf. *crisatellus*. Dieu. TL: 9.8. *Myiophoneus glaucinus*: slightly larger. *Zoothera monticola*: condylus medialis is more oval than round in med. view. *Acridotheres tristis*: dorsal edge of p. std. is less curved; sulcus std. is slightly wider. *Acridotheres ginginianus*: considerably smaller. *Sturnus vulgaris*: similar, but bigger. *Sturnia pagodarum*: much bigger. *Gracupica nigricollis*: similar; slightly narrower epiphysis; less protruding lat. surface of the condylus med. *Sturnus vulgaris*: much bigger. *Mino kreffti*: smaller; p. stn. protruding. *Ampeliceps coronatus*: bigger; p. stn. relatively narrower. *Streptocitta albigollis torquata*: smaller; p. stn. protruding. *Acridotheres javanicus*: slightly bigger; condylus med. less rounded. *Acridotheres crisatellus*: complete similarity (Table 90; Figure A9e).

Table 90. Measurements of tbt. dist. of fossil and recent Sturnidae (Ref. to Figure A9e).

Species	a	b	c
Fossil—Dieu			
<i>Acridotheres</i> cf. <i>crisatellus</i> NMNHS 12499	3.4	5.6	3.1
Recent			
<i>Acridotheres cristatellus</i> NHMT 1868.9.12.12	3.6	5.5	3.0
<i>Acridotheres cristatellus</i> NHMT 1850.8.15.138	3.5	4.9	2.6
<i>Acridotheres tristis</i> NHMT 1986.75.53	3.7	5.2	2.8
<i>Acridotheres tristis</i> NHMT 1986.75.52	3.6	5.3	2.8
<i>Acridotheres ginginianus</i> NHMT 1992.41.7	3.0	4.3	2.2
<i>Acridotheres javanicus</i> NHMT 1891.7.20.179	3.4	4.8	2.3
<i>Acridotheres fuscus</i> NHMT 1891.7.20.179	3.4	4.8	2.3
<i>Acridotheres ginginianus</i> NHMT 1991.1.47	3.1	4.7	2.1
<i>Ampeliceps coronatus</i> NHMT 1983.1.1	3.4	4.6	2.3
<i>Mino kreffti</i> NHMT 1961.11.32	4.6	6.0	3.1
<i>Streptocitta albigollis torquata</i> NHMT 1872.7.21.3	4.1	5.6	2.3
<i>Gracupica nigricollis</i> NHMT 1869.10.19.15	5.1	5.6	2.4
<i>Sturnus vulgaris</i> NHMT 1985.84.1	2.7	3.8	1.9

Sturnidae gen. Starling

Tbt. dist. sin. juv., NMNHS 12318 Sturnidae gen. (Figure A17c). Dieu. TL: 15.5. *Gracupica nigricollis*: rounder condylus med. and condylus lat. *Acridotheres tristis*: more round instead of oval condylus med. and condylus lat. *Acridotheres cristatellus*: very similar, but the condylus med. is less rounded. *Sarcops calvus*: slightly bigger; narrower epiphysis. *Acridotheres fuscus*: slightly bigger. *Acridotheres ginginiuanus*: much bigger. *Gracula religiosa*: more rounder condylus lat. *Sturnus contra*: considerably bigger. Four species of starlings (*Sturnus sericeus*, *Sturnus sinensis*, *Sturnus cineraceus*, and *Acridotheres burmannicus*) that are spread in Vietnam could not be compared because of the lacking of comparative skeletal material (Table 91; Figure A9f).

Tbt. dist. dex., NMNHS 12385 Sturnidae gen. (Figure A17d,e) Dieu. *Gracupica nigricollis*: parallel condylus lat. and condylus med. in the vent. view. *Acridotheres tristis*: slightly smaller; more parallel condylus lateralis and condylus medialis. *Acridotheres cristatellus*: smaller; relatively narrower distal epiphysis. *Sarcops calvus* and *Acridotheres fuscus*: condylus lat. and condylus med. is more rounded. *Acridotheres ginginiuanus*: more parallel condylus med. and condylus lat. *Gracula religiosa*: similar; more parallel condylus lat. and condylus med. *Sturnus contra*: bigger; the diaphysis is more straight in its distal part. Four species of starlings (*Sturnus sericeus*, *Sturnus sinensis*, *Sturnus cineraceus*, and *Acridotheres burmannicus*) that are spread in Vietnam could not be compared because of the lack of comparative skeletal material (Table 90).

cf. Sturnidae gen. Starling

Humerus dist. dex., NMNHS 12372 (Figure A17f) cf. Sturnidae gen. TL—16.0. Proc. flexorius and proc. supracondylaris dorsalis are not preserved. This finding has a typical g. *Sturnus* appearance. *Sturnus sinensis*: larger; deeper fossa musculusbrachialis; sulcus musculi scapulotricipitis more transversal to the longitudinal axis of the bone (i.e., dyaphysis), which distinguishes it from the morphologically very similar ireniids and refers the specimen to Sturnidae (*Sturnus vulgaris* and *Irena puella* have been compared). *Sturnus vulgaris* and *Sturnus contra*: similar, but the fossa olecrani are narrower and better

outlined. *Gracupica nigracollis*: considerably smaller; the fossa olecrani are narrower and better outlined (Table 92; Figure A9g).

Table 91. Measurements of tbt. dist. of fossil and recent Sturnidae gen. (Ref. to Figure A9f; e—minimum breadth of diaphysis).

Species	a	b	c	d	e
Fossil—Dieu					
Sturnidae gen. NMNHS 12318	5.3	ca. 5.7	5.5	ca. 4.9	2.8
Sturnidae gen. NMNHS 12385	ca. 4.5	4.9	4.4	3.7	3.0
Recent					
<i>Gracupica nigracollis</i> NHMT 1869.10.19.15	5.0	5.5	5.5	3.9	3.3
<i>Sturnus contra</i> NHMT 1992.41.3	3.0	4.2	4.2	3.0	2.3
<i>Acridotheres tristis</i> NHMT 1957.15.9	6.0	4.1	5.2	5.0	3.2
<i>Acridotheres tristis</i> NHMT 1986.75.52	5.0	5.4	5.4	5.2	3.4
<i>Acridotheres cristatellus</i> NHMT 1968.9.12.12	5.1	5.3	5.1	3.7	3.3
<i>Acridotheres fuscus</i> NHMT 1991.1.47	4.5	4.8	4.7	4.2	2.8
<i>Acridotheres ginginiuanus</i> NHMT 1993/1/16	4.0	4.2	3.9	2.9	2.5
<i>Sarcops calvus</i> NHMT 1989.32.1	4.4	4.8	5.0	4.8	2.9
<i>Gracula religiosa</i> NHMT 1982.113.1	4.6	5.1	5.2	4.1	3.2
<i>Gracula religiosa</i> NHMT 1991.1.44	4.6	5.0	4.7	3.8	3.1

Table 92. Measurements of humerus dist. of fossil and recent Sturnidae (Ref. to Figure A9g).

Species	a	b	c
Fossil—Dieu			
cf. Sturnidae gen. NMNHS 12372	3.5	2.05	2.8
Recent			
<i>Sturnus vulgaris</i> NHMT 1973.29.14	3.6	2.1	3.3
<i>Sturnus vulgaris</i> NHMT 1975.51.8	3.8	2.4	3.4
<i>Sturnus contra</i> NHMT 1992.41.82	3.4	2.1	3.2
<i>Gracupica nigracollis</i> NHMT 1869. 10.19.15	4.5	2.7	4.3
<i>Sturnus sinensis</i> UCBL	2.7	1.5	2.4
<i>Irena puella</i> NHMT 1975.95.1	3.9	2.1	3.4
<i>Irena puella</i> NHMT 1846.5.5.15	3.9	2.3	3.3
<i>Irena puella</i> NHMT 1969.1.151	3.9	2.0	3.5

3.10.8. Troglodytidae Swainson, 1832

Troglodytes troglodytes (Linnaeus, 1758) Eurasian Wren

Not present in the recent country's fauna (Supplementary Materials, Map 43). IUCN—LC. Cmc sin., NMNHS 12478 *Troglodytes troglodytes* Maxa I. (Figure A18i) Maxa I. TL: 7.70. This finding has all the features of a passerine bird (first of all, a straight and almost parallel os metacarpale 2 and os metacarpale 3). Having an extremely small size (for a passerine), it could theoretically belong to no more than 10–15 species of birds in the same size range. With the exception of the Neotropical and Australian-New Zealand small bird species, only a few species remain in the Palearctic and Indo-Malay regions. The comparison with Regulidae (*R. regulus*), in addition to the metric, also shows clearly morphological differences. *T. troglodytes*: complete similarity (Table 93).

Table 93. Measurements of cmc of fossil and recent Troglodytidae (a—maximal total length; b—width of prox. epiphysis, incl. pr. metacarpalis I; c—width of distal epiphysis).

Species	a	b	c
Fossil—Maxa I			
<i>Troglodytes troglodytes</i> NMNHS 12478	7.70	1.77	-
<i>Troglodytes troglodytes</i> NMNHS 12467	7.68	2.27	1.67
<i>Troglodytes troglodytes</i> NMNHS 12502	7.65	ca. 2.19	ca. 1.70
Recent			
<i>Troglodytes troglodytes</i> NMNHS 1/1985	8.02	2.00	1.89
<i>Troglodytes troglodytes</i> NMNHS 2/1990	8.24	1.92	1.65
<i>Troglodytes troglodytes</i> NMNHS 3/1994	7.85	2.32	1.83
<i>Troglodytes troglodytes</i> NMNHS 5/2001	8.10	2.90	1.75
<i>Troglodytes troglodytes</i> NMNHS 4/1997	7.93	1.98	1.80

Cmc sin., NMNHS 12502 *Troglodytes troglodytes* Maxa I. (Figure A18j) Maxa I. TL: 7.65. The comparison notes are as NMNHS 12478 (Table 93). Cmc sin., NMNHS 12467 *Troglodytes troglodytes* Maxa I. (Figure A18h) Maxa I. TL: 7.68. The comparison notes are as NMNHS 12478 (Table 93). Cmc prox. sin., NMNHS 12506 *Troglodytes troglodytes* Maxa I. (Figure A18k) Maxa I. TL: 4.54. The comparison notes are as NMNHS 12478. Tmt prox. dex., NMNHS 12446 *Troglodytes troglodytes* Maxa I. (Figure A18g) Maxa I. TL: 8.37. This finding has all the features of a passerine bird (first of all, a straight and almost parallel os metacarpale 2 and os metacarpale 3). Having an extremely small size (for a passerine), it could theoretically belong to no more than 10–15 species of birds in the same size range. With the exception of the Neotropical and Australian-New Zealand small bird species, only a few species remain in the Palearctic and Indo-Malay regions. The comparison with Regulidae (*R. regulus*), in addition to the metric, also shows clearly morphological differences. *T. troglodytes*: complete similarity (Table 94).

Table 94. Measurements of tmt of fossil and recent Troglodytidae (a—maximal width of prox. epiphysis; b—thickness of prox. epiphysis; c—thickness of diaphysis in the middle).

Species	a	b	c
Fossil—Maxa I			
<i>Troglodytes troglodytes</i> NMNHS 12446	1.98	1.87	0.83
Recent			
<i>Troglodytes troglodytes</i> NMNHS 1/1985	2.06	2.07	0.85
<i>Troglodytes troglodytes</i> NMNHS 2/1990	1.83	1.81	0.78
<i>Troglodytes troglodytes</i> NMNHS 3/1994	2.35	2.21	0.88
<i>Troglodytes troglodytes</i> NMNHS 5/2001	2.11	2.12	0.78
<i>Troglodytes troglodytes</i> NMNHS 4/1997	1.98	2.20	0.88
<i>Troglodytes troglodytes</i> NMNHS 6/2021	1.84	2.05	0.76

3.10.9. Muscicapidae Fleming, J., 1822

Myophonus caeruleus (Scopoli, 1786) Blue Whistling Thrush

Former breeds were in Soviet C Asia, Afganistan, N Pakistan, NW, N, NE Indian subcontinent, S, SE Tibet, China (except NW, NE), Sumatra, and Java; some northern populations winter to the south and in S China. It is a common resident (except in C Thailand and Cochinchina). It is an uncommon winter visitor of E Myanmar, NW, NE

Thailand, Laos, W, E Tonkin, and N Annam. This was recorded in the winter (status uncertain) of Cochinchina [7] (Supplementary Materials, Map 44). IUCN—LC.

Tmt. prox. sin., NMNHS 12456 (Figure A17m,n). *Myophonus caeruleus*. Dieu. TL: 15.4. *T. viscivorus*, *T. merula*, *T. pilaris*, *T. olivaceus*, *T. philomelos*, *T. iliacus*, *T. poliocephalus*, and *Z. cyanotus*: much smaller. *M. glaucinus*: shallower extensorius on facies dorsalis. *M. caeruleus*: complete morphological identity (Table 95).

Table 95. Measurements of tmt prox. of fossil and recent Turdidae (a—width of proximal epiphysis; b—thickness of proximal epiphysis (incl. hypotarsus); c—cranio-caudal diameter of cotyla med.).

Species	a	b	c
Fossil—Dieu			
<i>Myophonus caeruleus</i> NMNHS 12456	6.1	6.2	ca. 3.5
Recent			
<i>Myophonus caeruleus</i> NHMT 1933.11.16.32	6.5	6.4	3.7
<i>Myophonus glaucinus</i> NHMT 1846.5.5.12	5.6	5.9	3.6
<i>Turdus poliocephalus</i> NHMT 1975.3.7	4.2	4.2	2.5
<i>Turdus viscivorus</i> NHMT 1985.41.5	5.1	4.9	3.0
<i>Turdus merula</i> NHMT 1982.159.3	4.8	4.7	2.8
<i>Turdus pilaris</i> NHMT 1998.56.1	4.8	4.7	2.8
<i>Turdus iliacus</i> NHMT 1985.11.7	4.0	3.9	2.3
<i>Turdus philomelos</i> NHMT 1981.89.3	4.2	-	2.4
<i>Turdus olivaceus pelios</i> NHMT 1977.8.62	4.5	4.1	2.5
<i>Geokichla citrina cyanotus</i> NHMT 1972.1.113	4.0	4.0	2.8
<i>Geokichla interpres</i> NHMT 1850.8.15.144	4.4	-	2.7
<i>Monticola solitarius</i> NHMT 1860.7.22.17	3.9	3.0	2.5

Cmc. prox. dex., NMNHS 12419 (Figure A17o). *Myophonus caeruleus*. Dieu. TL: 8.6. *T. viscivorus*, *T. merula*, *T. pilaris*, *T. olivaceus*, *T. philomelos*, *T. iliacus*, *T. poliocephalus*, and *Z. cyanotus*: much larger. *M. glaucinus*: similar; smaller. *M. caeruleus*: complete morphological identification (Table 96; Figure A8c).

Table 96. Measurements of cmc. prox. of fossil and recent Turdidae (Ref. to Figure A8c).

Species	a	b	c
Fossil—Dieu			
<i>Myophonus caeruleus</i> NMNHS 12419	3.4	5.2	ca. 3.5
Recent			
<i>Myophonus temminckii</i> [<i>Myophonus caeruleus temminckii</i>] NHMT 1933.11.16.32	3.3	5.3	3.7
<i>Myophonus glaucinus</i> NHMT 1846.5.5.12	2.6	4.6	3.2
<i>Turdus poliocephalus tempesti</i> NHMT 1975.3.7	2.2	3.6	2.5
<i>Turdus viscivorus</i> NHMT 1985.41.5	3.0	5.1	2.9
<i>Turdus merula</i> NHMT 1982.159.3.	2.6	4.0	2.5
<i>Turdus pilaris</i> NHMT 1998.56.1	2.6	4.3	3.0
<i>Turdus iliacus</i> NHMT 1985.11.7	2.5	3.9	2.5

Table 96. Cont.

Species	a	b	c
<i>Turdus philomelos</i> NHMT 1981.89.3	2.1	3.7	2.4
<i>Turdus olivaceus pelios</i> NHMT 1977.8.62	2.2	3.8	2.4
<i>Geokichla citrina cyanotus</i> NHMT 1972.1.113	2.1	3.4	2.4
<i>Geokichla interpres</i> NHMT 1850.8.15.144	2.3	4.0	3.1
<i>Monticola solitarius</i> NHMT 1860.7.22.17	2.8	3.8	2.6

Myophonus sp. (cf. *caeruleus*) Blue Whistling Thrush

Former breeds were in Soviet C Asia, Afganistan, N Pakistan, NW, N, NE Indian subcontinent, S, SE Tibet, China (except NW, NE), Sumatra, and Java; some northern populations winter to the south and in S China. It is a common resident (except C Thailand and Cochinchina). It is an uncommon winter visitor of E Myanmar, NW, NE Thailand, Laos, W, E Tonkin, and N Annam. This was recorded in the winter (status uncertain) of Cochinchina [7]. Tbt. dist. sin., NMNHS 12460 (Figure A17p,q) cf. *Myophonus* sp. (cf. *temminckii*). Dieu. TL: 16.3. This finding corresponds to the morphology of thrushes. *T. pilaris* and *T. merula*: much larger. *T. viscivorus*: larger; more symmetrical condylus med. *Z. monticola*: slightly larger and more asymmetrical condylus lateralis. *Myophonus glaucinus*: narrower distal epiphysis; slightly larger. (*M. glaucinus* is one of the largest thrushes in SE Asia [6]). *Myophonus temminckii*: very similar (Table 97; Figure A9h).

Table 97. Measurements of tbt. dist. of fossil and recent Turdidae (Ref. to Figure A9h).

Species	a	b	c	d
Fossil—Dieu				
cf. <i>Myophonus</i> sp. NMNHS 12460	5.2	3.4	5.7	6.0
Recent				
<i>Myiophoneus glaucinus</i> NHMT 1846.5.5.12	5.3	3.3	4.7	5.1
<i>Myiophoneus temminckii</i> NHMT 1933.11.16.32	5.8	4.3	4.2	5.8
<i>Zoothera monticola</i> NHMT 1952.2.632	4.9	4.0	5.0	4.6
<i>Turdus merula</i> NHMT 1982.159.3	4.2	3.1	3.9	4.0
<i>Turdus pilaris</i> NHMT 1998.56.1	4.6	3.4	4.3	4.3
<i>Turdus viscivorus</i> NHMT 1985. 41.5	4.6	2.9	4.3	4.6

3.10.10. Regulidae Vigors, 1825

Regulus regulus (Linnaeus, 1758) Goldcrest

Not present in the recent country's fauna (Supplementary Materials, Map 45). IUCN—LC.Cmc prox. sin. NMNHS 12479 (Figure A18o) Maxa I. TL: ca. 7.3 (this finding has been damaged during its processing).

This finding has all the features of a passerine bird (first of all, a straight and almost parallel os metacarpale 2 and os metacarpale 3). Having a extremely small size (for a passerine), it could theoretically belong to no more than 10–15 species of birds in the same size range. With the exception of the Neotropical and Australian-New Zealand small bird species, only a few species remain in the Palearctic and Indo-Malay regions. The comparison with Troglodytidae (*Tr. troglodytes*), in addition to the metric, also shows clearly morphological differences. The only fossil species in the genus *Regulus* (*R. bulgaricus* Boev, 1999) is known by a single bone—complete ulna [32] and is incomparable with the fossils from N. Vietnam. *Regulus regulus*: complete similarity (Table 98).

Table 98. Measurements of cmc of fossil and recent Regulidae (a—maximal total length; b—width of prox. epiphysis, incl. pr. metacarpalis I; c—width of distal epiphysis).

Species	a	b	c
Fossil—Maxa I			
<i>Regulus regulus</i> NMNHS 12479	7.15	2.16	ca.1.75
Recent			
<i>Regulus regulus</i> NMNHS 1/1992	7.26	1.78	1.76
<i>Regulus regulus</i> NMNHS 2/1993	7.16	1.90	2.16
<i>Regulus regulus</i> NMNHS 4/2011	7.97	1.96	1.81

3.10.11. Irenidae Jerdon, 1863 Fairy-Bluebird

Irena puella (Latham, 1790) Asian Fairy-Bluebird

This is a resident of S India, NE Indian subcontinent, Sri Lanka, Andaman Is, SW China, Greater Sundas, and the Philippines (Palawan). It is a fairly common to common resident (except Thailand) [7] (Supplementary Materials, Map 46). IUCN—LC. Ulna dist. sin., NMNHS 12444 (Figure A17r,s) *Irena puella*. Preserved are about two-fifths of the bone. All tiny features, incl. papillae remigales caudales, are also excellently preserved. *Irena puella*: complete dimensional and morphological similarity. *Chloropsis* is a similar genus of Chloropidae, presently spread throughout Vietnam and Indochina, but it includes species of a considerably smaller size. The three species of Vietnam (*Chl. harwicki*, *Chl. aurifrons*, and *Chl. cochinchinensis*) are distinguishably smaller in size (Table 99; Figure A4f).

Table 99. Measurements of ulna dist. of fossil and recent Irenidae (Ref. to Figure A4f).

Species	a	b	c	d
Fossil—Dieu				
<i>Irena puella</i> NMNHS 12444	3.2	3.9	3.2	2.2
Recent				
<i>Irena puella</i> NHMT 1978.24.1	3.2	3.9	3.2	2.3
<i>Irena puella</i> NHMT 1969.1.152	3.4	4.2	3.3	2.3
<i>Chloropsis hardwicki</i> NHMTS 1992.41.69	2.6	3.2	2.1	1.8
<i>Chloropsis cochinchinensis</i> NHMTS 1987.15.12	2.5	2.9	2.7	1.8
<i>Chloropsis aurifrons</i> NHMTS 1982.20.1	2.6	3.2	2.0	1.9

Coracoid dex., NMNHS 12453 (Figure A17t) *Irena puella*. Size, shape, and proportions resemble species of Sturnidae, but the details in the morphology of the acrocoracoidal part of the bone show its belonging to the closest family, Irenidae: *Sturnus vulgaris* and *St. contra*: similar in general shape and proportions; slightly smaller; sulcus m. supraoracoidei of clear triangle shape. *Aplonis metallica*, *Aplonis panayensis*, and *Lamprotornis caudatus*: slightly smaller; less hooked in the acrocoracoidal part. *Cosmopsarus regius*: almost similar in size; longer fac. art. humeralis; less hooked in the acrocoracoidal part. The finding needs to be compared with following sturnids: *Sturnus sericeus*, *Sturnus sinensis*, *Sturnus cineraceus*, and *Acridotheres burmannicus* (all lacking in the NHMTS collections, 2007). *Irena puella*: complete similarity, both in size and morphology (Table 100; Figure A9i).

Table 100. Measurements of coracoid of fossil and recent Irenidae (Ref. to Figure A9i).

Species	a	b	c	d
Fossil—Dieu				
<i>Irena puella</i> NMNHS 12373	-	4.2	5.1	1.6
<i>Irena puella</i> NMNHS 12453	23.9	4.3	5.2	1.7
<i>Irena cf. puella</i> NMNHS 12417	-	-	ca. 5.2	1.8
<i>Irena</i> sp. NMNHS 12416	-	ca. 3.5	5.3	-
Recent				
<i>Irena puella</i> NHMT 1969.1.152	25.6	4.8	5.2	1.8
<i>Irena puella</i> NHMT 1973.24.1	24.5	4.5	5.0	1.8
<i>Irena puella</i> NHMT 1969.1.151	24.8	4.9	5.2	1.9
<i>Irena puella</i> NHMT 1975.95.1	26.0	4.8	-	2.0
<i>Irena puella</i> NHMT 1999.38.2	24.7	4.1	4.9	1.8
<i>Sturnus contra</i> NHMT 1992.41.83	26.0	3.8	5.0	1.8
<i>Sturnus vulgaris</i> NHMT 1973.44.1	25.8	3.9	5.2	1.6
<i>Aplonis metallica</i> NHMT 1972.1.146	24.0	3.6	4.3	1.7
<i>Aplonis panayensis</i> NHMT 1993.24.10	23.4	3.8	4.6	1.7
<i>Lamprotornis caudatus</i> NHMT 1981.61.3	ca. 25.8	ca. 3.7	ca. 4.7	1.8
<i>Cosmopsarus regius</i> NHMT 1993.32.5	23.1	3.9	4.5	1.6

Coracoid omal dex., NMNHS 12373 (Figure A17u) *Irena puella*. Size, shape, and proportions resemble species of Sturnidae, but the details in the morphology of the acrocoracoidal part of the finding show its belonging to the family Irenidae: *Sturnus vulgaris* and *St. contra*: similar in general shape and proportions; slightly smaller; sulcus musculi supraoracoidei of clear triangle shape. *Aplonis metallica*, *Aplonis panayensis* and *Lamprotornis caudatus*: slightly smaller; less hooked in the acrocoracoidal part. *Cosmopsarus regius*: almost similar in size; longer fac. art. humeralis; less hooked in the acrocoracoidal part. Because of the lacking of comparative material, the following sturnids remained uncomparing: *Sturnus sericeus*, *Sturnus sinensis*, *St. cineraceus*, and *Acridotheres burmannicus*. *Irena puella*: complete similarity, both in size and morphology (Table 99). Cmc. prox. dex., NMNHS 12387 (Figure A17v) *Irena puella*. This finding shows all the features of Irenidae, i.e., the extremely developed pr. intermetacarpalis, relatively small pr. alularis, distal cranial enlargement of os metacarpalis majus, etc. It clearly differs from all of the compared species of *Chloropsis*. *Irena puella*: Complete similarity (Table 101; Figure A8c).

Irena cf. puella Asian Fairy-Bluebird

This is a resident of S India, NE Indian subcontinent, Sri Lanka, Andaman Is, SW China, Greater Sundas, and the Philippines (Palawan). It is a fairly common to common resident (except in Thailand) [7]. Cmc prox. dex., NMNHS 12492 (Figure A17w) *Irena cf. puella*. Only the prox. part of the os met. majus and tr. carpalis and part of the pr. intermetacarpalis are preserved. The finding surely belongs to Oscines. *Chloropsis* spp.: larger size; longer synostosis met. prox. *Irena puella*: very similar, both in morphology and size (Table 100). Humerus prox. sin., NMNHS 12455 (Figure A17x,y). *Irena cf. puella*. TL: 5.9. The find represents only the epicondylus prox. Even the crista is missing, but the morphology of the caput humeri, incisura capitis, fossa pneumaticipitalis, tub. dorsale and tub. ventrale, allow us to trace a considerable similarity to the medium-sized Oscines, and especially the Irenidae and *Irena puella*. *Chloropsis hardwickei* and *Chloropsis aurifrons*: much bigger (Table 102).

Table 101. Measurements of cmc. of fossil and recent Irenidae (Ref. to Figure A8c; d—maximum length of cmc.).

Species	a	b	c	d
Fossil—Dieu				
<i>Irena puella</i> NMNHS 12387	2.7	2.6	2.9	-
<i>Irena cf. puella</i> NMNHS 12492	ca. 2.4	ca. 3.2	ca. 2.8	-
<i>Irena sp.</i> (excl. <i>I. puella</i>) NMNHS 12454	ca. 2.3	2.6	2.6	15.2
Recent				
<i>Chloropsis hardwickei</i> NHMTS 1992.41.69	1.9	2.1	2.4	14.7
<i>Chloropsis cochinchinensis</i> NHMTS 1987.15.12	1.9	1.8	2.2	15.2
<i>Chloropsis aurifrons</i> NHMTS 1973.53.1	1.8	2.1	2.5	15.0
<i>Chloropsis sonerati</i> NHMTS 1850.8.15.100	2.2	2.3	2.5	15.3
<i>Irena puella</i> NHMT 1999.38.2	2.2	3.2	3.2	17.1
<i>Irena puella</i> NHMT 1969.1.151	2.2	3.2	3.4	18.3

Table 102. Measurements of humerus prox. of fossil and recent Irenidae (a—thickness of caput humeri; b—length of caput humeri from tub. dorsalis to incisura capitis).

Species	a	b
Fossil—Dieu		
<i>Irena cf. puella</i> NMNHS 12455	3.2	7.1
Recent		
<i>Irena puella</i> NHMT 1975.95.1	3.3	7.0
<i>Irena puella</i> NHMT 1973.24.1	3.1	7.1
<i>Irena puella</i> NHMT 1999.38.2	3.3	7.4
<i>Irena puella</i> NHMT 1969.1.151	3.5	7.6
<i>Irena puella</i> NHMT 1973.1.152	3.4	7.5
<i>Irena puella</i> NHMT 1846. 5.5.15	3.1	7.1
<i>Chloropsis hardwickei</i> NHMTS 1992.41.69	2.4	5.4
<i>Chloropsis aurifrons</i> NHMTS 1982.20.1	2.4	5.3

Coracoid omal dex., NMNHS 12417 (Figure A17z) *Irena cf. puella*. This finding represents the distal (humeral) half of the bone. The acrocoracoidal part is not preserved. The region of the scapulo-coracoidal joint is perfectly preserved and shows considerable similarity to Irenidae, esp. *Irena puella* (Table 99). Ulna prox. sin., NMNHS 12426 (Figure A18a,b). *Irena cf. puella*. TL: 12.4. This find belongs to a semi-adult individual. All of the features strongly correspond to *Irena puella* (Table 103; Figure A9j).

Irena sp. Fairy-Bluebird

Coracoid omal dex., NMNHS 12416 *Irena sp.* (Figure A18c). The hooked acrocoracoidal part is not preserved. All the features indicate, both in morphology and dimensionally, a specimen of g. *Irena*, similar to *Irena puella*. It differs by the less developed hook of the hooked acrocoracoidal part. The bad preservation of the finding does not allow its further identification (Table 100).

Table 103. Measurements of ulna prox. of fossil and recent Irenidae (Ref. to Figure A9j).

Species	a	b	c
Fossil—Dieu			
<i>Irena</i> cf. <i>puella</i> NMNHS 12426	5.0	3.0	4.6
Recent			
<i>Irena puella</i> NHMT 1975.95.1	5.1	2.9	4.8
<i>Irena puella</i> NHMT 1973.24.1	5.1	3.2	4.8
<i>Irena puella</i> NHMT 1999.38.2	5.0	3.2	4.8
<i>Irena puella</i> NHMT 1969.1.151	5.1	2.9	5.1
<i>Irena puella</i> NHMT 1846.5.5.15	5.3	3.5	5.3
<i>Irena puella</i> NHMT 1969.1.152	5.2	3.3	5.0

Irena sp. (excl. *I. puella*) (Fairy-Bluebird)

Cmc dex., NMNHS 12454 (Figure A18d) *Irena* sp. (excl. *Irena puella*). This finding is a complete cmc of an almost intact preservation, except pr. alularis. Its general shape, size and proportions strongly resemble *Chloropsis* species, but it differs from the three compared species, *Chloropsis hardwickei*, *Chloropsis cochincinensis*, and *Chloropsis aurifrons* in the same way: a more caudal position of pr. intermetacarpalis; absence of a processus on the dorso-cranial edge of osmetacarpalis majus; longer synostosis carpometacarpalis prox.; wider spatium intermetacarpalis. *Irena puella*: extremely similar, but smaller in size. Because of the lack of comparative material, other species of the family of the specimen remained uncomparated (Table 101).

Irenidae gen. (cf. *Irena*)

Humerus dist. dex. NMNHS 12371 (Figure A18e) Irenidae gen. (cf. *Irena*): TL: 12.8. Proc. flexorius is not preserved. The find has a typical for g. *Sturnus* appearance. *Sturnus sinensis*: larger; deeper fossa musculi brachialis; the sulcus m. scapulotricipitis is more parallel to the longitudinal axis of the bone (i.e., dyaphysis), which distinguishes it from the morphologically very similar sturnids and refers the specimen to Irenidae (*Irena puella* and *Sturnus vulgaris* have been compared). *Chloropsis* spp.: bigger; *Irena puella*: very similar; the proc. supracondylaris dorsalis is directed slightly more dorsally (Table 104; Figure A9k).

Table 104. Measurements of humerus dist. of fossil and recent Irenidae (Ref. to Figure A9k).

Species	a	b	c
Fossil—Dieu			
Irenidae gen. (cf. <i>Irena</i>) NMNHS 12371	3.4	2.0	3.0
Recent			
<i>Irena puella</i> NHMT 1973.24.1	3.9	2.0	3.4
<i>Irena puella</i> NHMT 1975.95.1	3.9	2.1	3.4
<i>Irena puella</i> NHMT 1846.5.5.15	3.9	2.3	3.3
<i>Irena puella</i> NHMT 1969.1.151	3.9	2.0	3.5
<i>Sturnus vulgaris</i> NHMT 1973.29.14	3.6	2.1	3.3
<i>Sturnus vulgaris</i> NHMT 1975.51.8	3.8	2.4	3.4
<i>Sturnus sinensis</i> UCBL	2.7	1.5	2.4

3.10.12. Chloropseidae Wetmore, 1960

Chloropsis hardwickii (Jardine and Selby, 1830) Orange-Bellied Leafbird

This is a resident of N, NE Indian subcontinent and southern China. It is an uncommon to locally common resident of Myanmar, W, NW, NE Thailand, Peninsular Malaysia, N, C Laos, and Vietnam (except Cochinchina) [7] (Supplementary Materials, Map 47). IUCN—LC. Humerus dist. sin., NMNHS 12458 (Figure A17l) *Chloropsis hardwickii*. General morphology, size, and proportion considerably resembles species of g. *Chloropsis*. *Chloropsis cochinchinensis*: bigger; thicker condylus ventralis. *Chloropsis aurifrons*: slightly bigger; deeper f. musculi brachialis. *Chloropsis cyanopogon*: considerably bigger. *Chloropsis hardwickii*: complete similarity (Table 105; Figure A9k).

Table 105. Measurements of humerus dist. of fossil and recent Irenidae (Ref. to Figure A9k).

Species	a	b	c
Fossil—Dieu			
<i>Chloropsis hardwickii</i> NMNHS 12458	6.5	ca. 3.1	1.8
Recent			
<i>Chloropsis hardwickii</i> NHMT 1992.41.68	6.2	3.1	1.7
<i>Chloropsis hardwickii</i> NHMT 1992.41.69	6.2	3.2	1.5
<i>Chloropsis cochinchinensis</i> NHMT 1969.1.150	5.3	2.7	1.7
<i>Chloropsis cochinchinensis</i> NHMT 1987. 15.12	5.7	2.6	1.5
<i>Chloropsis aurifrons</i> NHMT 1989.25.49	6.0	2.8	1.5
<i>Chloropsis aurifrons</i> NHMT 1973.53.1	5.9	3.0	1.8
<i>Chloropsis cyanopogon</i> NHMT 1969.1.149	4.9	2.4	1.5

3.11. Aves, Non-Passeriformes Indet.

Femur prox. sin., NMNHS 12323 Non-Passeriformes indet.—Dieu. TL: 22.3. A bone splinter of femur sin. prox. of a large bird of a pheasant size. Diameter in the wider part of diaphysis—9.8. Femur dex., NMNHS 12328 Non-Passeriformes indet. Dieu. TL: 25.8, maximum diameter: 4.8. A medial fragment of a diaphysis of the right femur of a juvenile individual of the *Arborophila brunneopectus* size. The slight bending of the diaphysis excludes it belonging to Passeriformes. Vertebra cervicalis 5, NMNHS 12321 Non-Passeriformes indet.—Dieu. TL: ca. 14.8. The finding has the general shape of the second cervical vertebra (epistropheus) (Table 106). Because of the thick petrified cover of clay, it cannot be further identified.

Table 106. Measurements of vertebra cervicalis of fossil and recent Aves, Non-Passeriformes (a—maximum length; b—maximum width; c—maximum height).

Species	a	b	c
Fossil—Dieu			
Aves, Non-Passeriformes NMNHS 12321	ca. 14.9	ca. 11.3	ca. 7.6
Aves, Non-Passeriformes NMNHS 12505	12.0	7.9	8.2

Vertebra cervicalis 2, NMNHS 12505 Non-Passeriformes indet.—Dieu. Part of the dorsal caudal part is not preserved (Table 105). Because of the thick petrified cover of clay, it cannot be further identified. Phalanx 1 dig. II pedis sin., NMNHS 12493—Dieu. Galliformes: does not have a groove of the dorsal side in the proximal end. Passeriformes: have a much less developed inception of the f. art. prox. in the lat. view. It obviously belongs to other Non-Passeriform order (Table 1) Tmt dex. dist. NMNHS 18640—Maxa I. TL—7.04 (Figure A18p).

3.12. *Oscines Fam. Indet.*

Coracoid omal dex., NMNHS 12411 *Oscines fam. indet.*—Dieu. TL—10.7. The specimen has been compared with some families that were excluded because of the considerable dimensional differences: Oriolidae, Sturnidae, Campephagidae, Turdidae, Corvidae, Regulidae, Muscicapidae, Sylviidae, Pycnonotidae, Dicruridae, and Muscicapidae. Cmc. sin. NMNHS 12319—Maxa I. TL—11.69 (Figure A18l). Cmc. sin. NMNHS 18641—Maxa I. TL—8.36 (Figure A18m).

Cmc. dex. prox. NMNHS 18642—Maxa I. TL—6.79. The dist. half of the bone is missing (Figure A18r). Cmc. sin. NMNHS 18643—Maxa I. TL—7.67. The tr. metacarpalis is missing. Cmc. sin. NMNHS 12512—Maxa I. TL—6.47 (Figure A18o). Cmc. sin. NMNHS 12525—Maxa I. TL—6.89 (Figure A18q).

3.13. *Aves Indet.*

Along with the identifiable bone findings, a number of small bone splinters of the diaphyses of the long bones (*ossa longa tubulossa*) have been collected in both examined Paleolithic sites. It is impossible to further identify them. Part of them could only to be termed as “Non-Passeriformes”. Some of the findings bear traces of processing (worked bones) and provide important archaeological information (taphonomy, utilisation, etc.). The list of them is given in Table 1 and completes the avian osteological material, as well as its lower taxonomical value.

Traditionally, pedal phalanges remain unidentified and their taxonomical belonging is given in very few paleornithological studies. Part of them have been identified and listed above. The remaining part of the finding are listed in Table 1.

4. Paleoavifaunal Analysis

The complete list of the Late Pleistocene avifauna of the examined localities consists in at least 53 species/genera recent taxa of 23 families and 10 avian orders (Tables 105 and 106). As observed, the Non-Passeriform birds prevail. They number 37 taxa, out of a total of 53. The galliforms are best represented (18 taxa, i.e., over 1/3 of all established birds in the sites). Some findings of *Arborophila* could not be referred to any of the known recent species (*Arborophila* sp. 1, 2, and 3). The passeriform are the most varied group, and are represented by 13 families and 16 species/genera at least. Four taxa have been established in the early Holocene deposits of Maxa I cave and 51 taxa in the late Pleistocene layers of the Dieu cave (Table 107).

A comparison allows one to evaluate the differences in the bird faunas between the regions of both studied Paleolithic sites (Dieu Cave and Maxa I Cave) and the recent avifaunas of five major regions (territories): (1) Thanh Hoa Province, (2) North Vietnam (except Thanh Hoa Province), (3) Vietnam (except North Vietnam), (4) Indochina (except Vietnam), and (5) Southeast Asia (except Indochina) (Table 106). Our data show that 26 species/taxa (49.0%) disappeared from the recent bird fauna of the Thanh Hoa Province; 21 species/taxa (39.6%) disappeared from the recent bird fauna of North Vietnam (except the Thanh Hoa Province); 18 species/taxa (33.9%) disappeared from the recent bird fauna of Vietnam (except North Vietnam); 15 species/taxa (28.3%) disappeared from the recent bird fauna of Indochina (except Vietnam), and 28 species/taxa (52.8%) disappeared from the recent bird fauna of Southeast Asia (except Indochina).

On the other hand, some more “boreal” avifaunal elements, such as *Surnia ulula*, *Turdus pilaris*, *Turdus iliacus*, and *Regulus regulus*, coexisted along with the majority of “tropical” birds, represented by various hornbills, pheasants, hill-partridges, mynas, barbets, leafbirds, whistling thrushes, fairy-bluebirds, laughing thrushes, orioles, needletail, etc. Such a varied bird fauna suggests much more varied habitats than what survived at present in the region. All this data firmly contradict the widely accepted notion that Indochina remained less affected by the climatic changes in the Pleistocene.

The taxa presently disappeared in the region of the localities (and the Tonkin region) after [6,26,33], are marked with “-”.

Table 107. Taxonomical composition of the Late Pleistocene and Early Holocene avian remains of Maxa I Cave and Dieu Cave (then the Hoa Province, Northern Vietnam) and avifaunal comparison between the late Pleistocene and recent bird fauna of North Vietnam. The disappeared species from the localities' area are marked with “-”, and the species that are still presented in the local avifauna are marked with “+”.

N	Taxa	Fossil			Recent			
		Maxa I Cave (Early Holocene)	Dieu Cave (Late Pleistocene)	Thanh Hoa Province	North Vietnam (Except Thanh Hoa Province)	Vietnam (Except North Vietnam)	Indochina (Except Vietnam)	Southeast Asia (Except Indochina)
GALLIFORMES								
Phasianidae								
1	Lophura diardi		+	+	+	+	+	-
2	Lophura nycthemera		+	+	+	+	+	-
3	Lophura edwardsi		+	-	-	+	-	-
	<i>Lophura nycthemera</i> / <i>Lophura edwardsi</i>		+					
	<i>Lophura</i> sp.		+					
4	<i>Chrysolophus amherstiae</i> (incl. <i>Chrysolophus</i> cf. <i>amherstiae</i>)		+	-	-	-	-	-
	<i>Chrysolophus</i> sp.		+					
5	Gallus gallus (incl. G. cf. gallus)		+	+	+	+	+	+
	cf. <i>Gallus</i> sp.		+					
6	<i>Phasianus colchicus</i>		+	-	+	-	-	-
7	<i>Polyplectron bicalcaratum</i>		+	+	+	+	+	-
8	<i>Polyplectron</i> cf. <i>germaini</i>		+	-	-	+	-	-
	aff. <i>Polyplectron</i> sp.		+					
9	<i>Syrmaticus humae</i>		+	-	-	-	-	-

[illegible]

Columbidae

Ardeidae

N	Taxa	Fossil				Recent		
		Maxa I Cave (Early Holocene)	Dieu Cave (Late Pleistocene)	Thanh Hoa Province	North Vietnam (Except Thanh Hoa Province)	Vietnam (Except North Vietnam)	Indochina (Except Vietnam)	Southeast Asia (Except Indochina)
20	cf. Ardeini gen. (? <i>Ardea</i> sp.)		+					
STRIGIFORMES								
Tytonidae								
21	aff. <i>Phodilus badius</i>		+	+	+	+	+	+
Strigidae								
22	<i>Surnia ulula</i>		+	-	-	-	-	-
ACCIPITRIFORMES								
Accipitridae								
23	<i>Nisaetus cirrhatus</i>			-	-	+	+	+
24	<i>Butastur indicus</i>		+	+	+	+	+	+
25	<i>Butastur</i> cf. <i>liventer</i>		+	-	-	+	+	+
26	<i>Buteo buteo</i>		+	-	-	-	-	-
27	cf. <i>Accipiter</i> (<i>gentilis</i> / <i>trivirgatus</i>)		+					
	cf. <i>Accipiter</i> (<i>gentilis</i>)		+					
FALCONIFORMES								
Falconidae								
28	<i>Falco</i> cf. <i>jugger</i>		+	-	-	-	+	-
29	<i>Polihierax</i> sp. (aff. <i>insignis</i>)		+	-	-	+	+	+
BUCEROTIFORMES								
Bucerotidae								

N	Taxa	Fossil				Recent		
		Maxa I Cave (Early Holocene)	Dieu Cave (Late Pleistocene)	Thanh Hoa Province	North Vietnam (Except Thanh Hoa Province)	Vietnam (Except North Vietnam)	Indochina (Except Vietnam)	Southeast Asia (Except Indochina)
20	cf. Ardeini gen. (? <i>Ardea</i> sp.)		+					
STRIGIFORMES								
Tytonidae								
21	aff. <i>Phodilus badius</i>		+	+	+	+	+	+
Strigidae								
22	<i>Surnia ulula</i>		+	-	-	-	-	-
ACCIPITRIFORMES								
Accipitridae								
23	<i>Nisaetus cirrhatus</i>			-	-	+	+	+
24	<i>Butastur indicus</i>		+	+	+	+	+	+
25	<i>Butastur</i> cf. <i>liventer</i>		+	-	-	+	+	+
26	<i>Buteo buteo</i>		+	-	-	-	-	-
27	cf. <i>Accipiter</i> (<i>gentilis</i> / <i>trivirgatus</i>)		+					
	cf. <i>Accipiter</i> (<i>gentilis</i>)		+					
FALCONIFORMES								
Falconidae								
28	<i>Falco</i> cf. <i>jugger</i>		+	-	-	-	+	-
29	<i>Polihierax</i> sp. (aff. <i>insignis</i>)		+	-	-	+	+	+
BUCEROTIFORMES								
Bucerotidae								

Table 107. Cont.

N	Taxa	Fossil				Recent		
		Maxa I Cave (Early Holocene)	Dieu Cave (Late Pleistocene)	Thanh Hoa Province	North Vietnam (Except Thanh Hoa Province)	Vietnam (Except North Vietnam)	Indochina (Except Vietnam)	Southeast Asia (Except Indochina)
30	<i>Anorrhinus</i> sp. (<i>A. tickelli</i>)	+	+	-	-	-	+	-
31	<i>Buceros</i> sp. (<i>Buceros</i> cf. <i>bicornis</i>)		+	+	+	+	+	+
32	<i>Anthracoceros albirostris</i>		+	+	+	+	+	+
33	<i>Aceros</i> sp. / (cf. <i>Rhyticeros undulatus</i>)		+					
34	<i>Rhinoplax vigil</i>		+	-	-	-	+	+
CAPRIMULGIFORMES								
Apodidae								
35	aff. <i>Hirundapus giganteus</i>		+	-	-	+	+	+
PICIFORMES								
Megalaaimidae								
36	<i>Psilopogon javanensis</i>		+	-	-	-	-	+
37	<i>Psilopogon haemacephalus</i>		+	-	+	+	+	+
Picidae								
38	<i>Dendrocopos darjeilensis</i>		+	-	+	-	+	-
	Picinae gen.		+					
PASSERIFORMES								
Oriolidae								
39	<i>Oriolus chinensis</i>		+	+	+	+	+	+

Table 107. Cont.

N	Taxa	Fossil			Recent			
		Maxa I Cave (Early Holocene)	Dieu Cave (Late Pleistocene)	Thanh Hoa Province	North Vietnam (Except Thanh Hoa Province)	Vietnam (Except North Vietnam)	Indochina (Except Vietnam)	Southeast Asia (Except Indochina)
Dicruridae								
39	<i>Dicrurus</i> sp.		+	+	+	+	+	+
Corvidae								
40	<i>Corvus corone/ macrorhynchos</i>		+	+	+	+	+	+
41	<i>Cissa chinensis</i>		+	+	+	+	+	+
	<i>Corvus</i> sp.		+					
	Corvidae gen.		+					
Leiotrichidae								
42	<i>Trochalopteron</i> cf. <i>milnei</i>		+	+	+	+	+	-
Cinclidae								
43	<i>Cinclus</i> sp. (aff. <i>pallasi</i>)		+	+	+	+	+	-
Turdidae								
44	<i>Turdus iliacus</i>		+	-	-	-	-	-
45	<i>Turdus pilaris</i>		+	-	-	-	-	-
46	<i>Turdus</i> aff. <i>merula</i>		+	-	-	-	-	-
Sturnidae								
47	<i>Acridotheres tristis</i> (incl. cf. <i>tristis</i>)		+	+	+	+	+	-
48	<i>Acridotheres</i> cf. <i>cristatellus</i>		+	+	+	+	+	+
	Sturnidae gen.		+					
	cf. Sturnidae gen.		+					

Table 107. Cont.

N	Taxa	Fossil			Recent			
		Maxa I Cave (Early Holocene)	Dieu Cave (Late Pleistocene)	Thanh Hoa Province	North Vietnam (Except Thanh Hoa Province)	Vietnam (Except North Vietnam)	Indochina (Except Vietnam)	Southeast Asia (Except Indochina)
Troglodytidae								
49	<i>Troglodytes troglodytes</i>	+		-	-	-	-	-
Muscicapidae								
50	<i>Myophonus caeruleus</i>		+	+	+	+	+	+
	<i>Myophonus</i> sp.		+	+	+	+	+	+
Regulidae								
51	<i>Regulus regulus</i>	+		-	-	-	-	-
Irenidae								
52	<i>Irena puella</i>		+	+	+	+	+	+
	<i>Irena</i> cf. <i>puella</i>							
	<i>Irena</i> sp.		+					
	Irenidae gen. (cf. <i>Irena</i>)		+					
Chloropseidae								
53	<i>Chloropsis hardwickii</i>		+	-	+	-	+	-
AVES INDET.								
	Non-Passeriformes indet.		+					
	Passeriformes indet.		+					

5. Paleoecological Comments

Boreal species found in the sites are of greater interest, as most of them mark their southernmost distribution in Southeast Asia. Such species are *Surnia ulula* (Supplementary Materials, Map 17), *Turdus pilaris* (Supplementary Materials, Map 39), and *Turdus iliacus* (Supplementary Materials, Map 38), which are exotic for the present local avifauna. Although they represent only 5.7 percent of the uncovered late Pleistocene avifauna of the region, their presence is a very clear indication for the former cooler environmental conditions. The same results have been received for terrestrial small mammals (Vassil Popov, unpubl. data).

It is worthy to mention that not only “boreal” birds disappeared from recent bird fauna in the region. In addition to the “boreal” bird species, some typical inhabitants of the subtropical forests such as pheasants, hornbills, swifts, woodpeckers, etc. have disappeared from the modern avifauna of the region. This second group may be due to extinction as a result of large-scale deforestation of large areas in the last millennia. A number of pheasants (Supplementary Materials, Maps 3, 8), diurnal raptors (Supplementary Materials, Map 24), hornbills (Supplementary Materials, Maps 23, 28), and barbets (Supplementary Materials, Map 30) also retreated their ranges southward at present (Table 106). Contrarily, the rock partridge, common buzzard, and Eurasian blackbird are spread much northwards than ca. 24,000–9000 years ago. The present study provides the first data on the Late Pleistocene history of the bird fauna of that part of Indochina. Future studies may confirm the impact of the cooler waves in the Pleistocene on the Indochinas environment.

Although lacking data on the former (even Quaternary) distribution of birds in Vietnam, some studies in neighbour regions (China) proved that it was strongly influenced by the vegetational (forest) cover [34].

6. Conservational Status

Four categories of the IUCN „Red List of threatened species” have been represented among the established birds in the sites: LC—28, NT—7, VU—2 (*Buceros bicornis* and *Rhyticeors undulates*), and CR—2 (*Lophura edwardsi* and *Rhinoplax vigil*).

7. Comments on Taphonomy

The collected material was accumulated by two different accumulating agents at least, being anthropogenic and natural—humans (Hòa Bình culture/Hoabinhian) and large owls, which were possibly *Bubo* spp. and/or *Ketupa* spp. Thus, both sites have mixed taphonomy, combining human and natural accumulations. Four species of these largest owls are now spread throughout the country: The Spot-bellied Eagle-Owl (*Bubo nipalensis* Hodgson, 1836), Brown Fish-Owl (*Ketupa zeylonensis* (Gmelin, 1788)), Tawny Fish-Owl (*Ketupa flavipes* (Hodgson, 1836)), and Buffy Fish-Owl (*Ketupa ketupu* (Horsfield, 1821)). All of these large owls usually inhabit caves or wide tree-hollows. We found some bones bearing clear traces of the raptor’s claws, for example *Arborophila* sp.—3 (humerus dex. NMNHS 12472), *Butastur* cf. *liventer*—humerus dex. prox. NMNHS 12352, and *Polihierax* sp. (aff. *insignis*)—ulna sin. dist. NMNHS 12438. On the other hand, some findings seem to have traces of digestion: *Arborophila* sp.—1—ulna dex. dist. NMNHS 12436 and Columbidae gen.—tmt sin. dist. No NMNHS 12341, *Irena puella*—ulna sin. dist. NMNHS 12444. Some of the fractures of the bones are specific for the large owls [35].

Some findings of the “edible”, which are mainly gallinaceous birds, bear signs of burning. This suggests human processing of the bodies of the killed birds. Many other birds (all passerines, raptors, woodpeckers, swifts, etc.) lack such traces of burning. It is worth mentioning that the mammalian remains described from these sites also show similar traces of processing/digestion [15].

As we do not have more detailed information on the deposition of the findings from the archaeologists who collected the avian bone material, more conclusions on the taphonomy of both sites would be speculative.

8. Comments on Traces

Some of the bone remains have been digested by large owls: NMNHS 12415 (Figure A10e).

Most of the bird species have been hunted by Paleolithic men. Some of the bone remains have been burnt—(possible) evidence for the human accumulation of the bones is: NMNHS, 12320, 12325, 12326, 12335, 12339, 12345, 12357 (Figure A11e), 12359, 12361, 12362, 12364, 12365 (Figure A10m), 12366, 12368, 12370, 12377 (Figure A11w), 12388, 12389, 12394, 12398, 12404, 12406, 12409, 12431, 12438 (Figure A14w,x), 12439, 12452 (Figure A12m), 12460, 12461, 12490 (Figure A11s), 12500, 12509, 12511, 12521, 12523, 12526, 12527, and 12529 (Figure A13u).

As observed, a total of 38 bone finds, representing 18.4% of the studied material, have been burnt. The bones of eleven species/taxa (11%) of a total of 54 (Table 106) bear traces of burning, as follows: *Anorrhinus* sp. (*tickelli*), *Anthracoceros albirostris*, *Arborophila brunneopectus*, *Arborophila torqueola*, *Arborophila* sp., *Corvus corone/macrorhynchos*, *Gallus gallus*, *Lophura* aff. *diardi*, and Phasianidae gen. In addition, two other species, an owl (*Phodilus badius*) and a whistling thrush (*Myophonus* sp. (cf. *caeruleus*)), also have burnt bones.

Very seldom, some findings bear traces of processing. A diaphysal fragment of the ulna of a large heron bears a carved hollow on its diaphysis (NMNHS 12443). Possibly, it was used as flute. Three leg bones (tbt) were broken the same way, with a wonderful accuracy, up to 0.2 mm. One of them was also burnt. In addition, the following bones have been also worked: NMNHS 12423 and 12452.

All elements of the axial skeletons (sternum, synsacrum, and vertebrae) are very rare in the collected samples. On the other hand, the long bones of legs have been broken uniformly and usually only their epiphyses have been preserved.

A series of five analogous fragments (NMNHS 12486–12490) suggests a special mode of processing of some of the bones. The tarsometatarsal spurs of the adult male large phasianids, for example, were probably used as a part of a more complex tool of an unknown purpose. The diaphysis of all of these tarsometatarsi were broken twice—above and below the spur section of the bone. As known, the tarsometatarsus is one of the most compact of the long bones (and all the bones) in the avian skeleton, and in normal natural conditions, it often remains preserved. When broken, the spire always remains attached to one of the detached parts. Unfortunately, we do not have more detailed information on the dating of the examined bones and they should all be considered “late Pleistocene to transition to early Holocene” without any further stratigraphic dividing.

9. Comments on Species' Representation

The prevailing share of the Red Junglefowl suggests the relative abundance, higher accessibility, and/or higher utilisation importance of that species as a game for the hunters of the Paleolithic cave settlements.

One of the findings (NMNHS 12349) suggests a larger cock (of *Gallus gallus*). In general, the gallinaceous birds are best represented in the examined bone material. Of the 39 Southeast-Asian species of Galliformes [6], 18 species/taxa (46.2 percent) are registered in the study findings. This is the highest group representation. The galliforms consist of 34 percent of all bird taxa recorded in both caves.

Of the 50 Southeast-Asian species of Accipitridae [6], 4 species/taxa (8.0 percent) are registered in the examined material. Of the 22 Southeast-Asian species of Corvidae [6], 2 species/taxa (9.1 percent) are registered in the examined material. Of the 13 Southeast-Asian species of Bucerothidae [6], 5 species/taxa (38.5 percent) are registered in the examined material. The largest bird species found in the caves is the great hornbill, while the smallest one is the goldcrest.

10. Conclusions

The presented paleoavifaunal research completely confirms the statement of [15], who believed that in the wide regions of the northern parts of the Indonesian biogeographical

province in the late Pleistocene, the climate was more cooler and drier, which limited the wet forests to a very small size.

Indeed, it is very possible that the distribution of some of the southern forms was facilitated by the existence of periods of broad terrestrial connection in the Pliocene and Pleistocene, possibly through the present aquatoria of the Sunda Shelf, as suggested [15].

Both of the studied sites, the caves Dieu and Maxa I, revealed the human exploitation of local birds and the richness of the late Pleistocene bird fauna of the northern part of the Indochina peninsula. Obviously, the population subsisted through non-specialized hunting and gathering, exploiting a variety of habitats in the vicinity of the caves.

Many of the recorded birds are still spread in the northern Indochina, but their ranges shifted for several hundred kilometers from the examined cave localities. The data of this study provide first knowledge of the former (late Pleistocene and early Holocene) distribution of several dozens of species of the highly diversified recent avifauna of Indocina.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/quat5030031/s1>, Maps 1–47: Prevalence of Early Holocene Birds relative to the Caves Dieu and Maxa I, Thanh Hoa Province.

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Conflicts of Interest: The author declares no conflict of interest.

Abbreviations/Nomenclature

(1) Institutions’ acronyms:

MNHNP—Musée Nationale d’Histoire Naturelle, Paris—France

MZUMM—Museum of Zoology, University of Michigan, Michigan—USA

NHMT—Natural History Museum, Tring—UK

NMNHS—National Museum of Natural History, Bulgarian Academy of Sciences, Sofia—Bulgaria

NMNHW—National Museum of Natural History, Smithsonian Institution, Washington—USA

UCBL—Centre des Sciences de la Terre, Université Claude Bernard—UMR Paléoenvironnements et Paléobiosphère—France

(2) Morphological terminology:

cmc.—carpometacarpus

dist.—distalis

f. a.—facies articularis med.—medialis

phalanx—phalanx

pr.—processus

prox.—proximalis

p. stn.—pons supratendineus

tmt.—tarsometatarsus

tbt.—tibiotarsus

tr.—trochlea.

tr. mt.—trochlea metatarsi

(3) Other: juv.—juvenile individual

sad.—subadult individual (all the remaining specimens to be considered adult)

TL—total length of the preserved bone fragment or of the whole bone, mainly the s. c. “anatomical length”, i.e., measured in the correct (anatomical) position of the bone.

Appendix A

Schemes of the method of measuring bone finds.

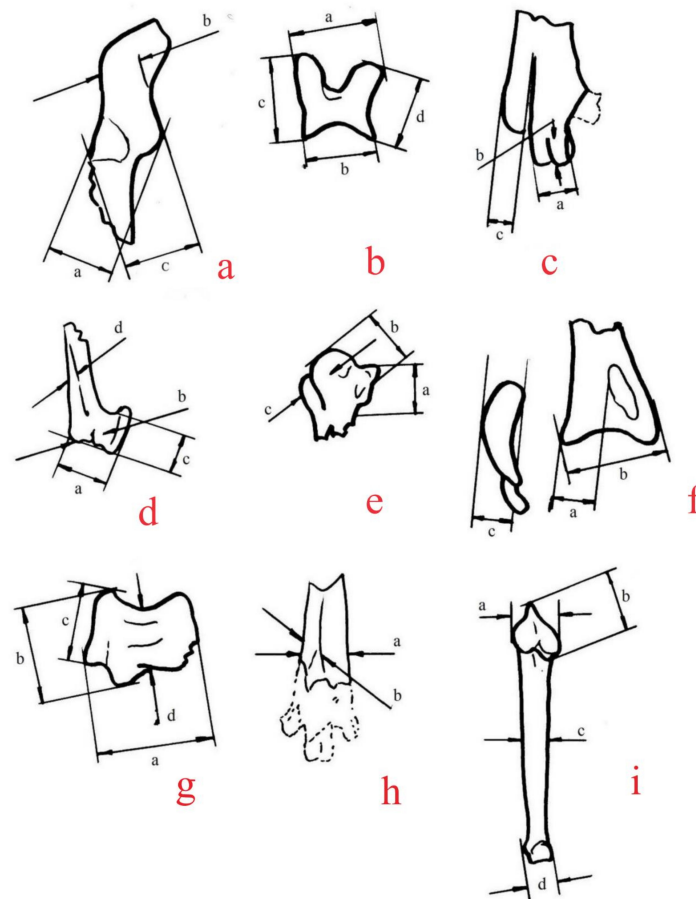


Figure A1. (a). Manner of the measurements of coracoid (omal part). (b). Manner of the measurements of distal tibiotarsus. (c). Manner of the measurements of distal tarsometatarsus. Figure (d). Manner of the measurements of distal carpometacarpus. Figure (e). Manner of the measurements of proximal carpometacarpus. (f). Manner of the measurements of coracoid (sternal part). (g). Manner of the measurements of distal femur. (h). Manner of the measurements of distal tarsometatarsus. (i). Manner of the measurements of ulna.

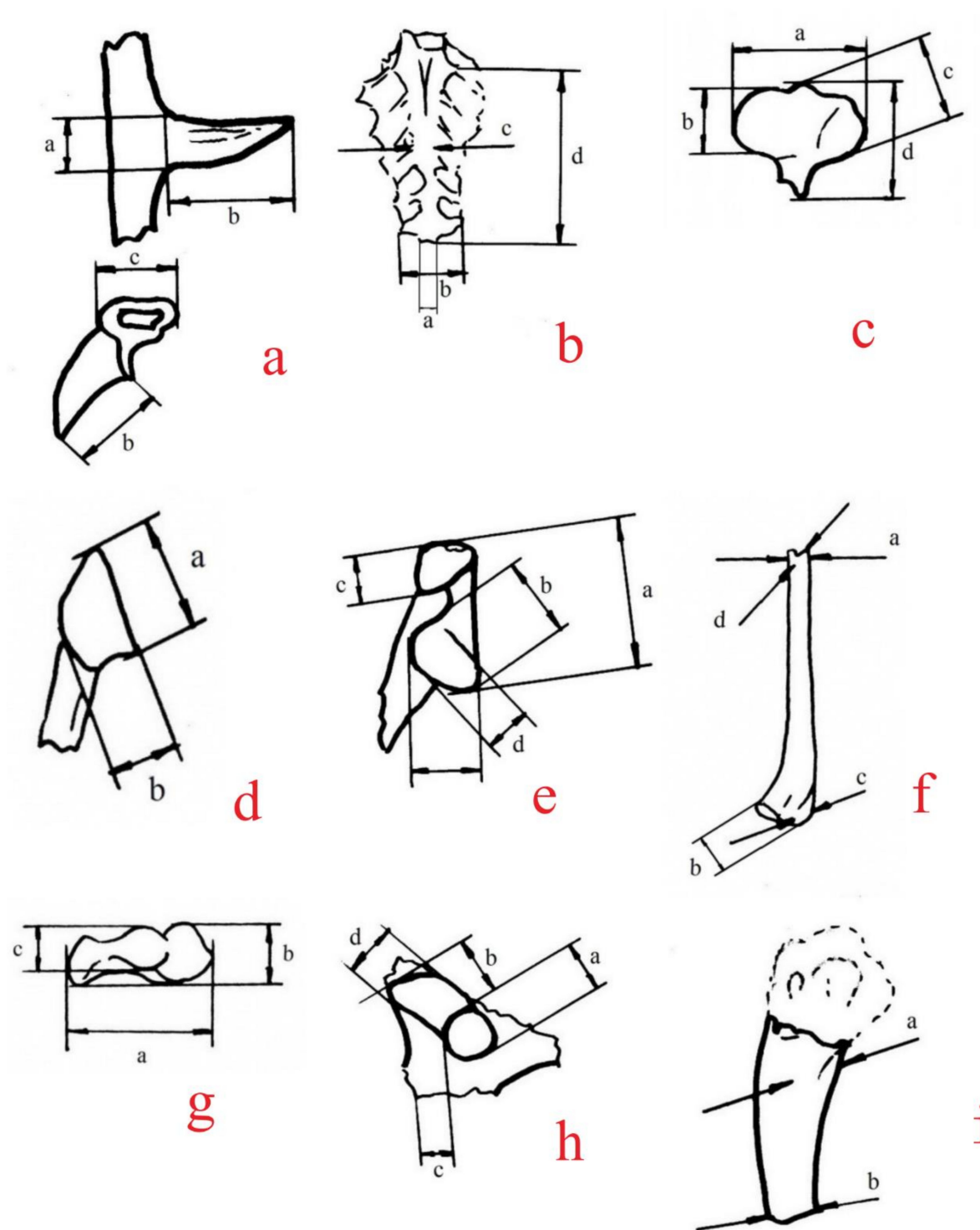


Figure A2. (a). Manner of the measurements of distal tarsometatarsus. (b). Manner of the measurements of synsacrum (corpora vertebrorum). (c). Manner of the measurements of proximal tarsometatarsus. (d). Manner of the measurements of proximal ulna. (e). Manner of the measurements of proximal scapula. (f). Manner of the measurements of radius. (g). Manner of the measurements of distal humerus. (h). Manner of the measurements of synsacrum (pars acetabularis). (i). Manner of the measurements of proximal humerus.

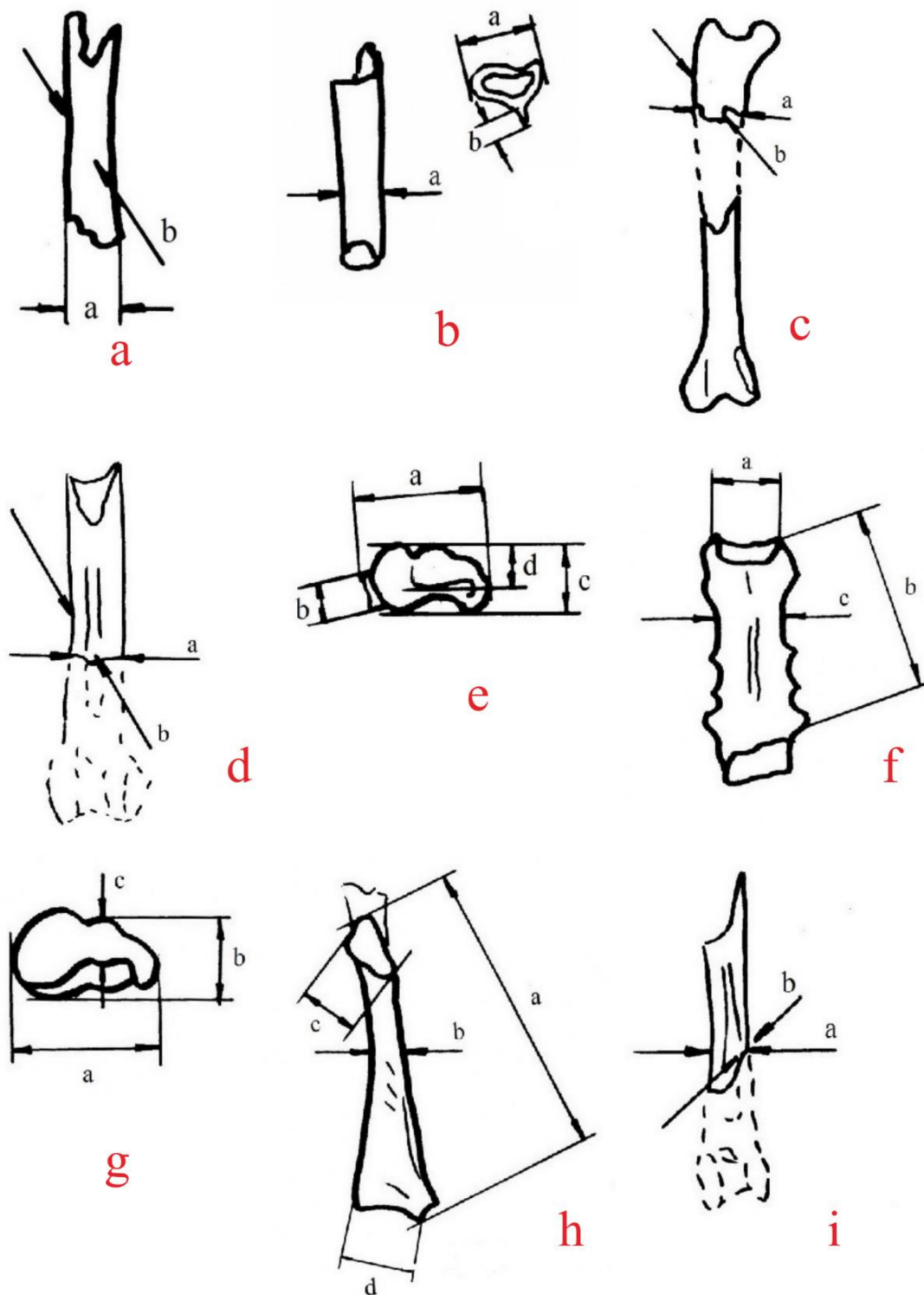


Figure A3. (a). Manner of the measurements of tarsometatarsus. (b). Manner of the measurements of tarsometatarsus. (c). Manner of the measurements of proximal femur. (d). Manner of the measurements of distal tibiotarsus. (e). Manner of the measurements of distal humerus. (f). Manner of the measurements of synsacrum (corpora vertebrorum). (g). Manner of the measurements of distal humerus. (h). Manner of the measurements of coracoid. (i). Manner of the measurements of distal tibiotarsus.

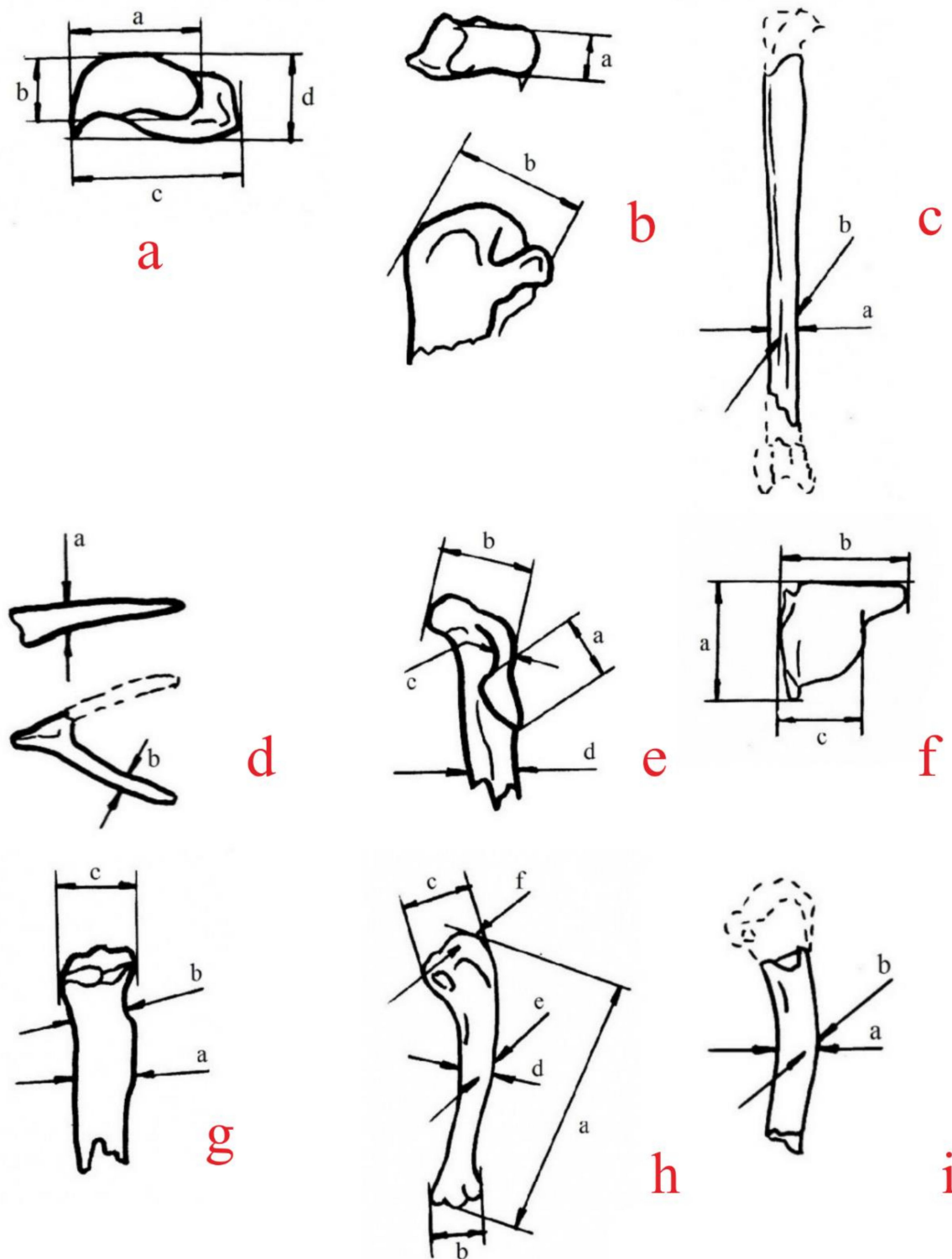


Figure A4. (a). Manner of the measurements of distal humerus. (b). Manner of the measurements of proximal humerus. (c). Manner of the measurements of tibiotarsus. (d). Manner of the measurements of furcula. (e). Manner of the measurements of coracoid (humeral part). (f). Manner of the measurements of distal ulna. (g). Manner of the measurements of proximal tibiotarsus. (h). Manner of the measurements of humerus. (i). Manner of the measurements of humerus.

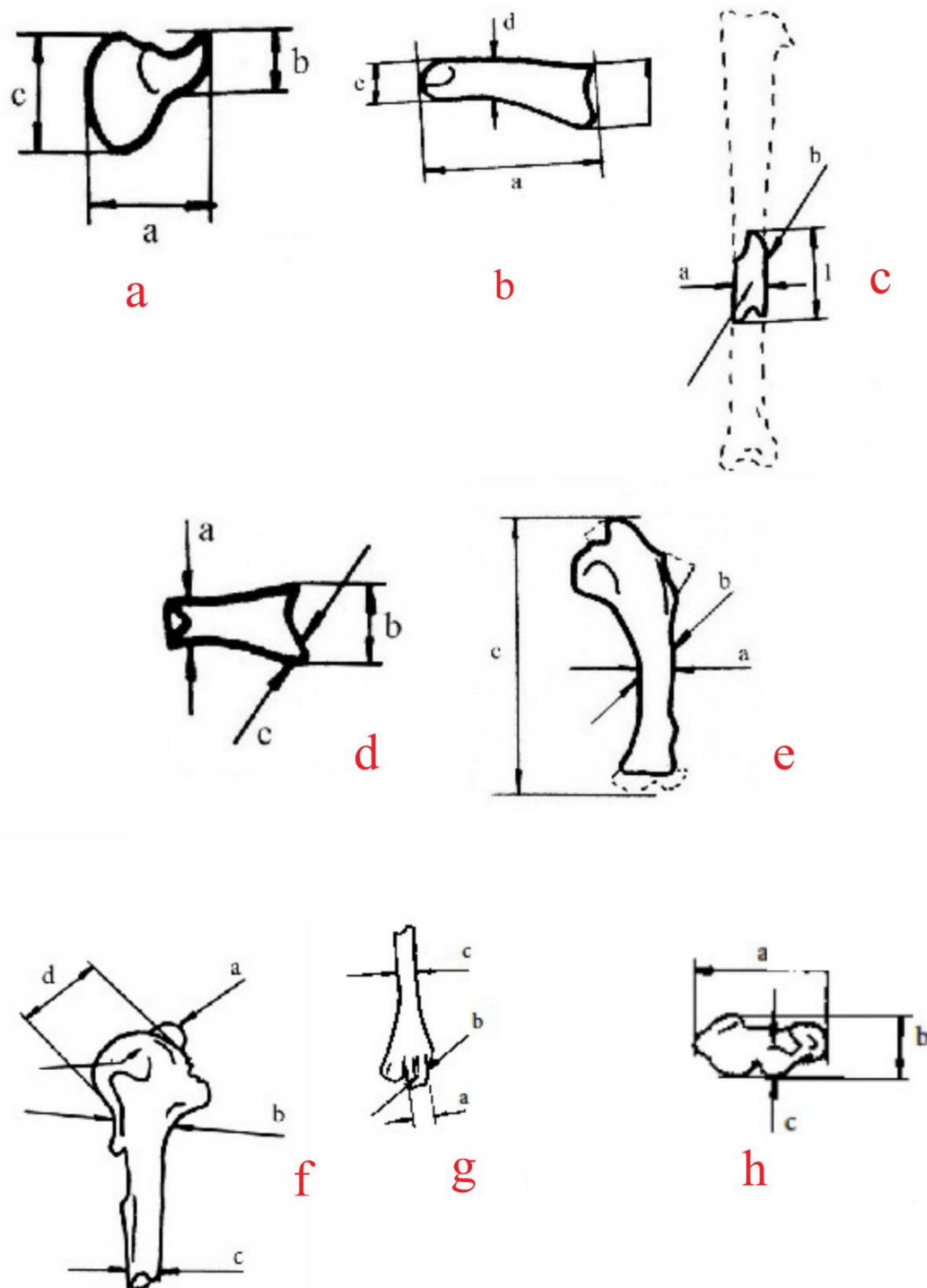


Figure A5. (a). Manner of the measurements of distal ulna. (b). Manner of the measurements of phalanx 2 dig. II pedis. (c). Manner of the measurements of tibiotarsus. (d). Manner of the measurements of phalanx 3 dig. II pedis. (e). Manner of the measurements of humerus. (f). Manner of the measurements of carpometacarpus. (g). Manner of the measurements of tarsometatarsus. (h). Manner of the measurements of distal humerus.

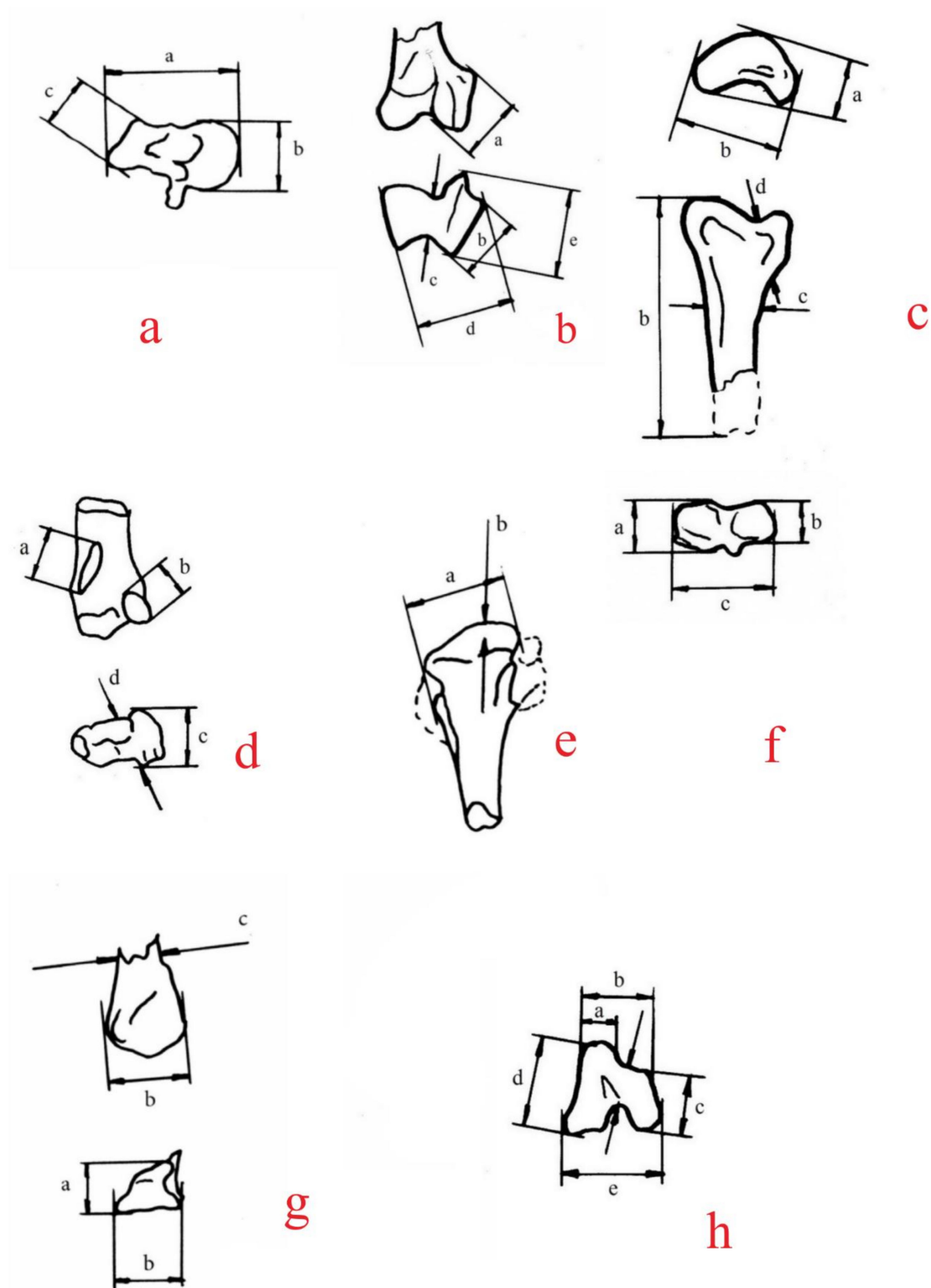


Figure A6. (a). Manner of the measurements of proximal tarsometatarsus. (b). Manner of the measurements of distal femur. (c). Manner of the measurements of phalanx 1 dig. I pedis. (d). Manner of the measurements of distal humerus. (e). Manner of the measurements of proximal humerus. (f). Manner of the measurements of proximal tarsometatarsus. (g). Manner of the measurements of distal ulna. (h). Manner of the measurements of distal tibiotarsus.

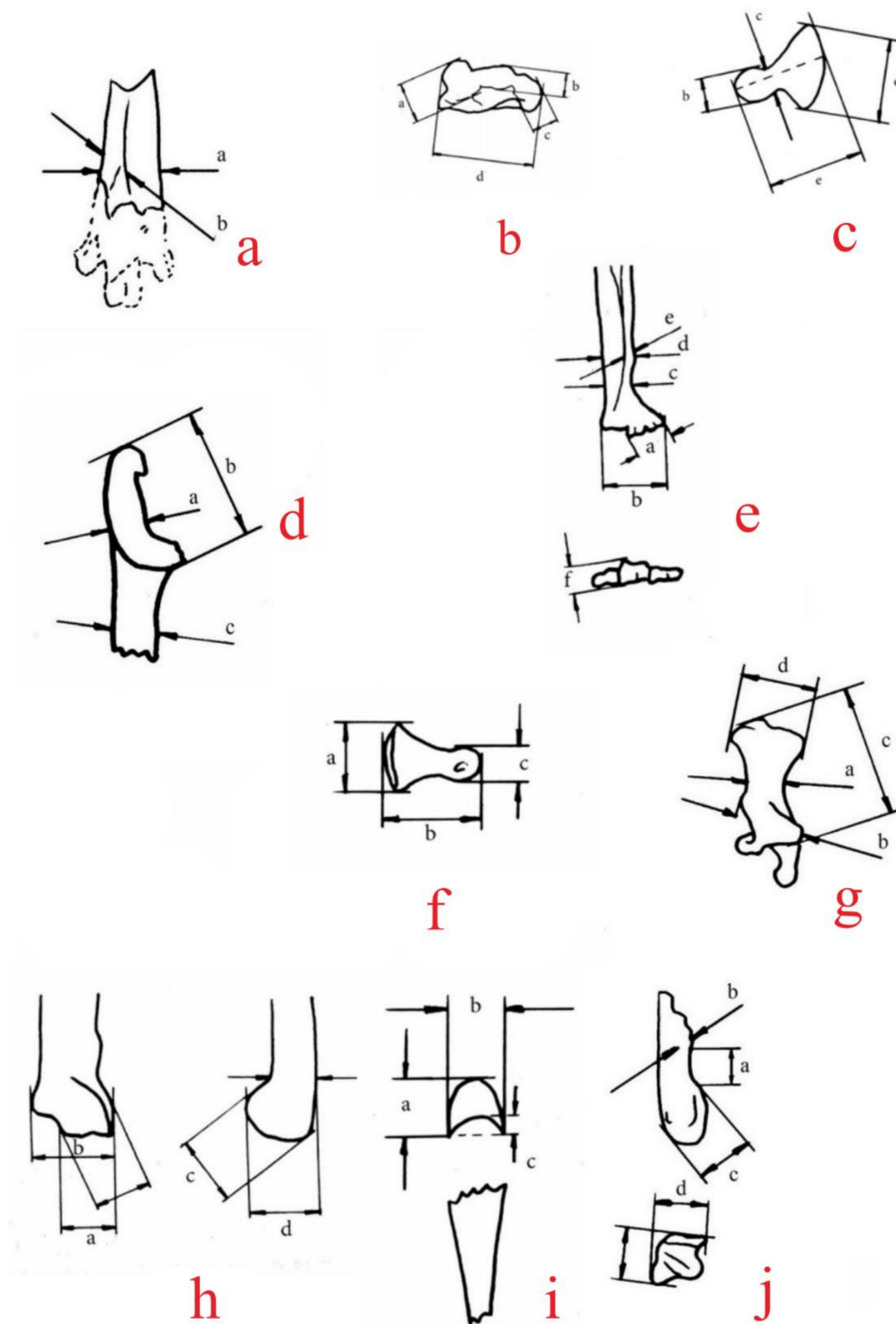


Figure A7. (a). Manner of the measurements of distal tarsometatarsus. (b). Manner of the measurements of distal humerus. (c). Manner of the measurements of proximal femur. (d). Manner of the measurements of coracoid omal. (e). Manner of the measurements of proximal femur. (f) Manner of the measurements of distal tarsometatarsus. (g). Manner of the measurements of os quadratum. (h). Manner of the measurements of distal ulna. (i). Manner of the measurements of os premaxillare. (j). Manner of the measurements of distal ulna.

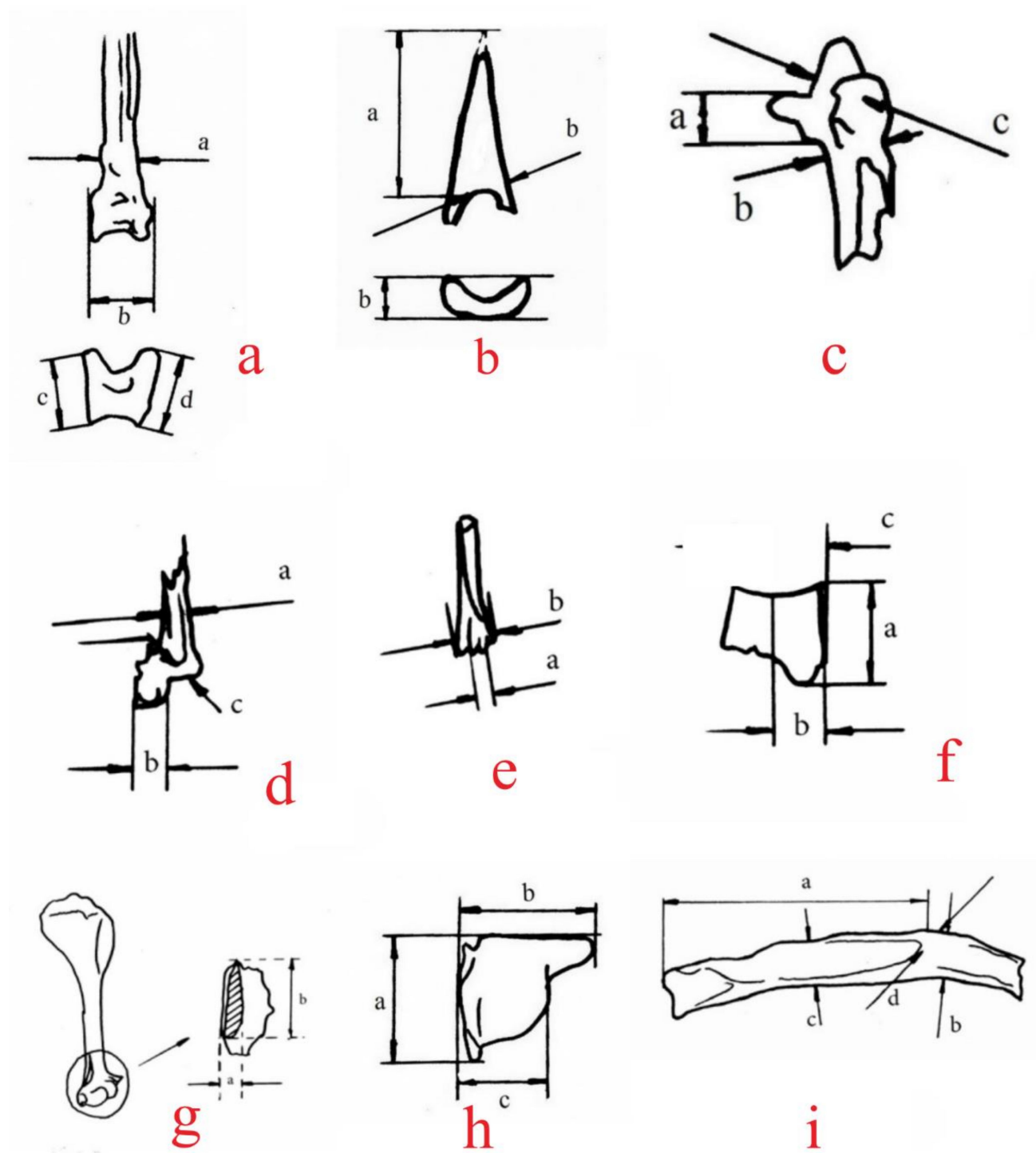


Figure A8. (a). Manner of the measurements of distal tibiotarsus. (b). Manner of the measurements of os premaxillare. (c). Manner of the measurements of proximal carpometacarpus. (d). Manner of the measurements of distal carpometacarpus. (e). Manner of the measurements of distal tarsometatarsus. (f). Manner of the measurements of distal tibiotarsus. (g). Manner of the measurements of distal humerus. (h). Manner of the measurements of distal ulna. (i). Manner of the measurements of mandibula.

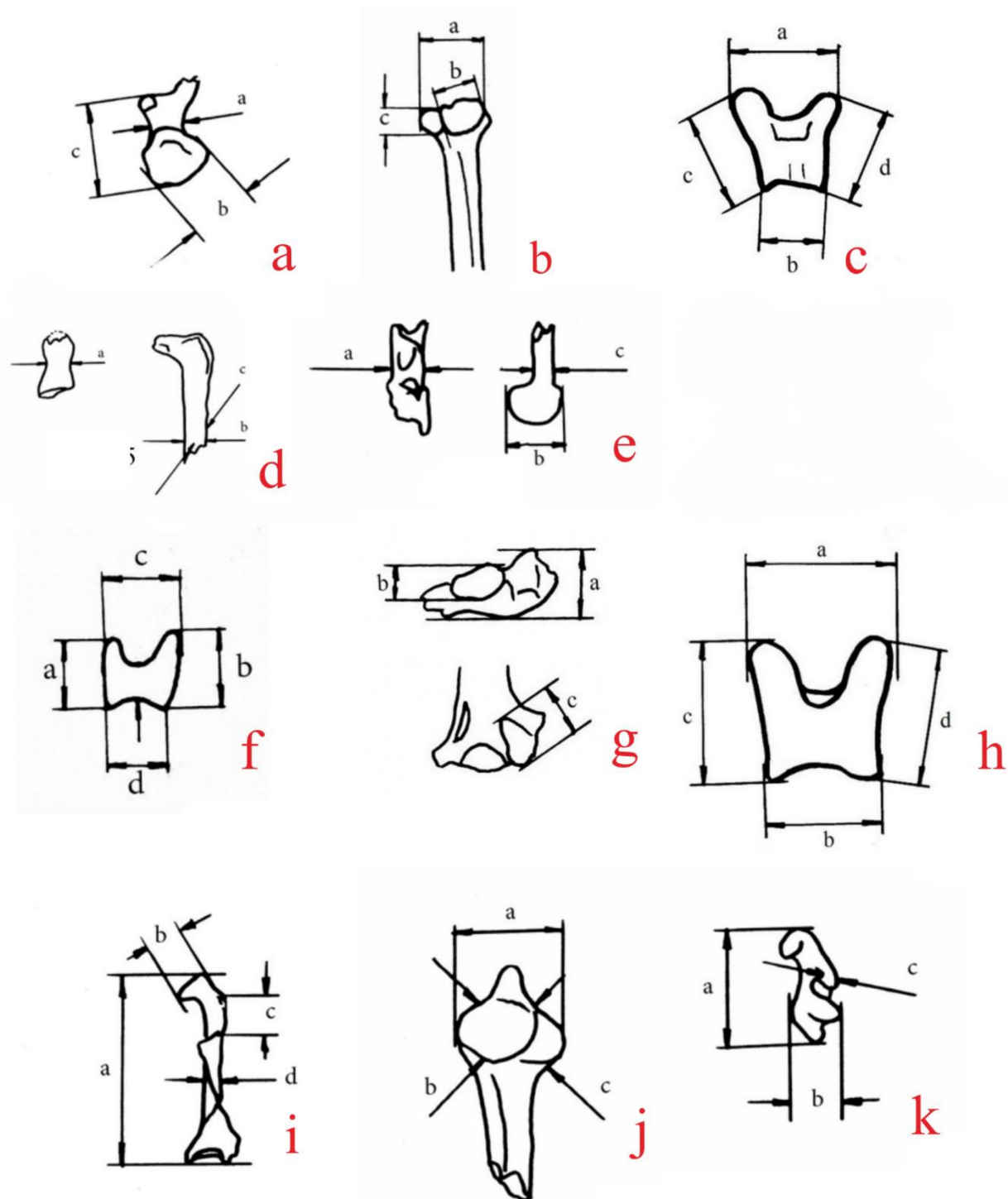


Figure A9. (a). Manner of the measurements of proximal scapula. (b). Manner of the measurements of proximal ulna. (c). Manner of the measurements of distal tibiotarsus. (d). Manner of the measurements of proximal femur. (e) Manner of the measurements of distal tibiotarsus. (f). Manner of the measurements of distal tibiotarsus. (g). Manner of the measurements of distal humerus. (h) Manner of the measurements of distal tibiotarsus. (i) Manner of the measurements of d coracoid. (j). anner of the measurements of proximal ulna. (k). Manner of the measurements of distal humerus.

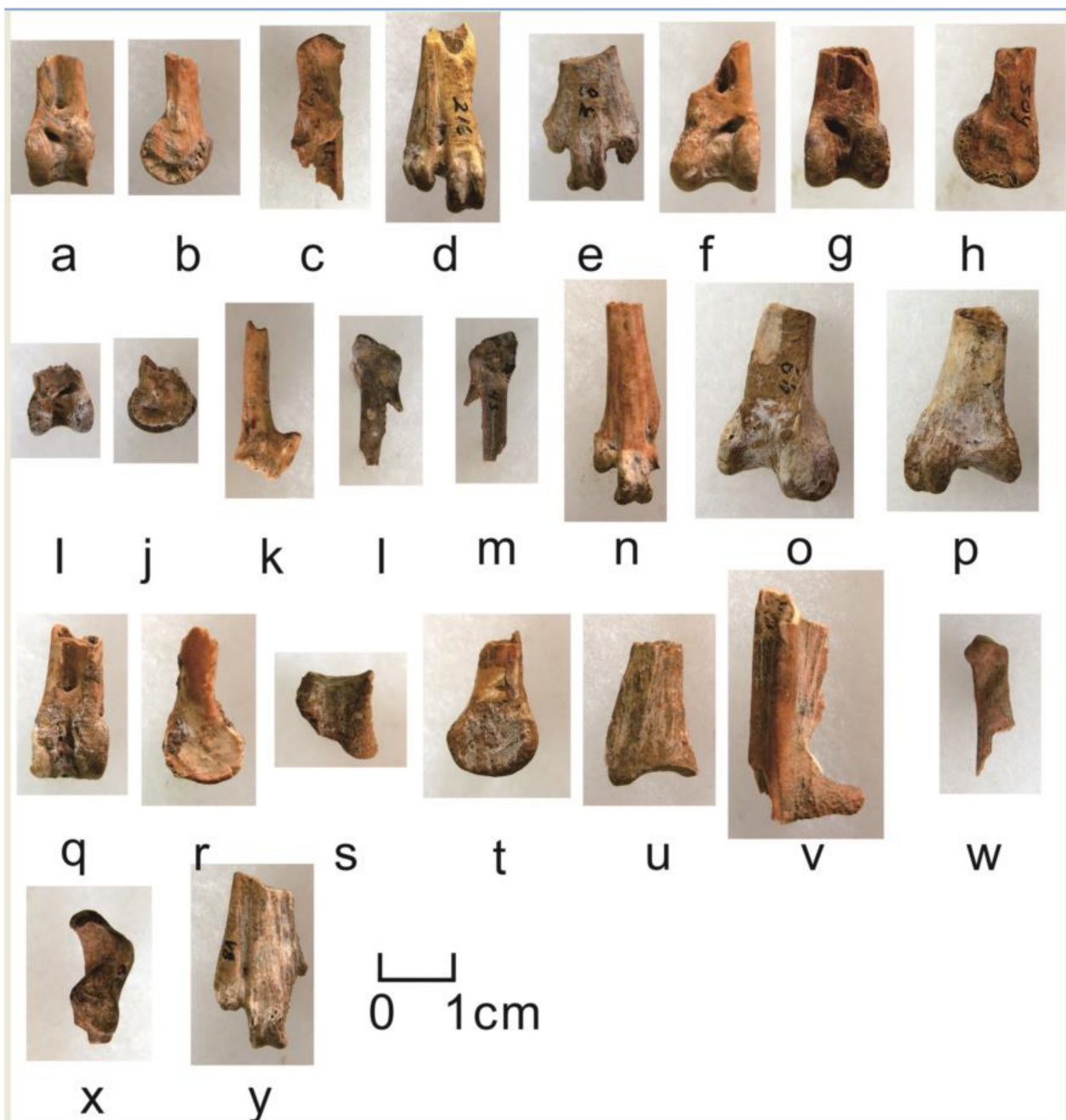


Figure A10. *Lophura diardi*—tbt. dist. sin., NMNHS 12330 (a,b); *Lophura diardi*—coracoid omal sin., NMNHS 12347 (c); *Lophura diardi*—tmt. dex. dist., NMNHS 12413 (d); *Lophura diardi*—tmt. sin. dist., NMNHS 12415 (e); *Lophura diardi*—tbt. dist. dex., NMNHS 12414 (f); *Lophura diardi*—tbt. sin. dist., NMNHS 12376 (g,h); *Lophura diardi*—tbt. dist. dex., NMNHS 12485 (i,j); *Lophura diardi*—cmc. sin. dist., NMNHS 12473 (k); *Lophura* aff. *diardi*—cmc. sin. prox., NMNHS 12365 (l,m); *Lophura nycthemera*—tmt. sin. dist., NMNHS 12332 (n); *Lophura nycthemera*—femur sin. dist., NMNHS 12327 (o,p); *Lophura* cf. *nycthemera*—tbt. dist. dex., NMNHS 12358 (q,r); *Lophura* cf. *nycthemera*—tbt. dist. dex., NMNHS 12348 (s,t); *Lophura nycthemera*—coracoid sternal dex., NMNHS 12360 (u); *Lophura* cf. *nycthemera*—tmt. dex., male ad. N 12350 (v); *Lophura edwardsi*—coracoid omal dext., NMNHS 12397 (w); *Lophura* aff. *imperialis*/*Lophura edwardsi*—coracoid omal dext., NMNHS 12356 (x); *Lophura* sp.—tmt. dex. dist. NMNHS 12334 (y). (Photographs: Assen Ignatov).

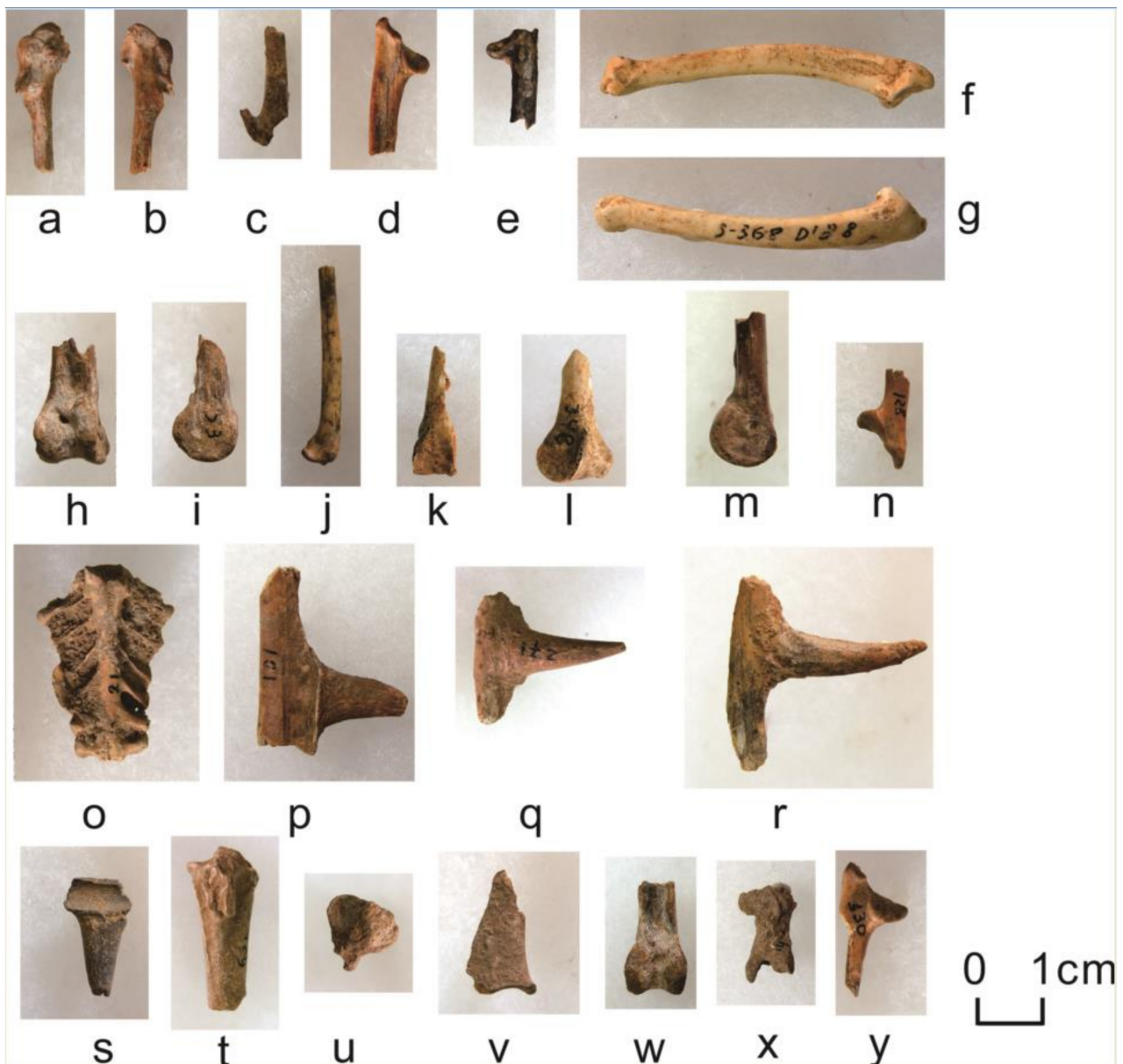


Figure A11. *Chrysolophus amherstiae*—cmc. sin. prox. NMNHS 12477 (a,b); *Chrysolophus* cf. *amherstiae*—cmc. sin. dist. NMNHS 12475 (c); *Gallus gallus*—scapula dex. prox., NMNHS 12331 (d); *Gallus gallus*—scapula dex. prox., NMNHS 12357 (e); *Gallus gallus*—ulna sin., NMNHS 12432 (f,g); *Gallus gallus*—tbt. sin. dist., NMNHS 12393 (h,i); *Gallus gallus*—radius dex. dist., NMNHS 12394 (j); cf. *Gallus gallus*—tbt. dist. dex., NMNHS 12395 (k,l); *Gallus gallus*—tbt. dist. sin., NMNHS 12396 (m); *Gallus gallus*—scapula dex. prox. NMNHS 12428 (n); *Gallus gallus*—synsacrum, copora vertebro-rum (caudal part) NMNHS 12483 (o); *Gallus gallus*—tmt (spure fragment) dex., NMNHS 12486 (p); *Gallus gallus*—tmt (spure fragment) dex., NMNHS 12487 (q); *Gallus gallus*—tmt (spure fragment) dex., NMNHS 12488 (r); *Gallus gallus*—tmt (spure fragment) dex., NMNHS 12490 (s); cf. *Gallus gallus*—tmt. sin. prox. NMNHS 12399 (t,u); cf. *Gallus gallus*—coracoid sternal dex., NMNHS 12316 (v); *Gallus gallus*—tbt. dex. dist. NMNHS 12377 (w); cf. *Gallus* sp.—vertebra cervicalis X NMNHS 12386 (x); *Phasianus colchicus*—scapula dex. prox., NMNHS 12400 (y). (Photographs: Assen Ignatov).



Figure A12. *Phasianus colchicus*—tbt. dex. dist. NMNHS 12424 (a,b); *Polyplectron bicalcaratum*—humerus sin. dist. NMNHS 12494 (c); *Polyplectron bicalcaratum*—vertebra cervicalis VII NMNHS 12333 (d); cf. *Lophophorus* sp.—humerus dex. prox. NMNHS 12363 (e); *Polyplectron* cf. *germaini*—cmc. sin. dist. NMNHS 12476 (f); aff. *Polyplectron* sp.—synsacrum, os ilium et acetabulum dex., NMNHS 12495 (g); Phasianidae gen.—scapula dex. prox., NMNHS 12423 (h); Phasianinae gen.—cmc. sin. prox. juv., NMNHS 12364 (i,j); Phasianinae gen.—scapula sin. prox., NMNHS 12484 (k); Phasianinae, male—tmt sin., NMNHS 12351 (l); Phasianinae gen.—femur dex. prox. NMNHS 12452 (m); Phasianinae gen.—femur dex. prox. NMNHS 12466 (n); cf. *Francolinus* sp.—tbt. sin. dist. NMNHS 12430 (o); *Alectoris chukar*—humerus sin. dist. NMNHS 12359 (p,q); *Arborophila brunneopectus*—tbt. sin. dist. NMNHS 12431 (r); *Arborophila brunneopectus*—cmc. dex. prox., NMNHS 12463 (s); *Arborophila brunneopectus*—tmt. dex. dist. NMNHS 12390 (t); *Arborophila brunneopectus*—coracoid dex., NMNHS 12369 (u); *Arborophila brunneopectus*—cmc. sin. prox. NMNHS 12474 (v,w); *Arborophila brunneopectus*—tmt. dex. dist. NMNHS 12391 (x); *Arborophila brunneopectus*—tbt. sin. dist. NMNHS 12366 (y,z). (Photographs: Assen Ignatov).



Figure A13. *Arborophila* cf. *brunneopectus*—scapula sin. prox., NMNHS 12464 (a); *Arborophila* cf. *brunneopectus*—humerus sin. prox. NMNHS 12471 (b); *Arborophila torqueola*—tmt. sin. dist. NMNHS 12500 (c); *Arborophila* cf. *torqueola*—humerus sin. prox. NMNHS 12354 (d); *Arborophila* cf. *torqueola*—tbt. sin., NMNHS 12370 (e); *Arborophila* cf. *torqueola*—furcula (clavicula sin.) NMNHS 12451 (f); *Arborophila* sp.—1—coracoid omal dex. NMNHS 12368 (g); *Arborophila* sp.—1—ulna dex. dist. NMNHS 12436 (h); *Arborophila* sp.—2—tbt. sin. prox. sad. NMNHS 12462 (i); *Arborophila* sp.—2—tbt. sin. dist. NMNHS 12335 (j,k); *Arborophila* sp.—2—tmt sin. prox. NMNHS 12406 (l,m); *Arborophila* sp.—3—tbt. dist. dex. NMNHS 12317 (n); *Arborophila* sp.—3—humerus sin. NMNHS 12470 (o); *Arborophila* sp.—3—humerus dex. NMNHS 12472 (p); cf. *Arborophila* sp.—femur dex. juv. NMNHS 12329 (q); *Arborophila* cf. *brunneopectus*—scapula dex. prox., NMNHS 12420 (r); Perdicinae gen.—ulna dex. dist., NMNHS 12355 (s,t); Perdicinae gen.—ulna dex. NMNHS 12529 (u); Perdicinae gen.—humerus dex. prox. NMNHS 12442 (v); Perdicinae gen.—cmc. sin. prox., NMNHS 12427 (w,x). Photographs: Assen Ignatov).



Figure A14. Phasianidae gen.—phalanx 3 dig. II pedis dex. N 12361 (a); Phasianidae gen.—phalanx 1 dig. II pedis dex. N 12435 (b); Phasianidae gen.—phalanx 1 dig. II pedis dex. NMNHS 12409 (c); Phasianidae gen.—phalanx 2 dig. II pedis sin. NMNHS 12450 (d); Phasianidae gen.—tbt. sin. NMNHS 12509 (e); *Ducula badia*—humerus dex. NMNHS 12518 (f); *Ducula badia*—cmc sin prox. NMNHS 12342 (g); cf. Columbidae gen.—tmt sin. dist. NMNHS 12341 (h,i); aff. *Phodilus badius*—humerus sin. dist. NMNHS 12404 (j); *Surnia ulula*—tmt. prox. sin. NMNHS 12382 (k); *Nisaetus cirrhatus*—femur dex. dist. NMNHS 12380 (l,m); aff. *Nisaetus* cf. *cirrhatus*—phalanx 1 dig. I pedis sin., NMNHS 12381 (n); *Butastur indicus*—humerus sin. dist., NMNHS 12434 (o); *Buteo buteo*—phalanx dist. dig. I pedis sin. NMNHS 12498 (p); Accipitridae gen.—phalanx dist. dig. pedis. NMNHS 12418 (q,r); cf. *Accipiter* (? *gentilis*)—phalanx 3 dig. II pedis sin. NMNHS 12491 (s); *Butastur* cf. *liventer*—humerus dex. prox. NMNHS 12352 (t,u); *Falco* cf. *jugger*—tmt. sin. prox. NMNHS 12408 (v); *Polihierax* sp. (aff. *insignis*)—ulna sin. dist. NMNHS 12438 (w,x); *Anorrhinus* sp. (? *tickelli*)—tbt. sin. dist. NMNHS 12338 (y,z). (Photographs: Assen Ignatov).



Figure A15. *Anorrhinus* sp. (*tickelli*)—tbt. dex. dist. NMNHS 12339 (a,b); *Anorrhinus* sp. (*tickelli*). tbt. dex. dist. NMNHS 12340 (c,d); *Anthracoceros albirostris*—coracoid omal sin. NMNHS 12325 (e,f); *Anorrhinus* sp. (? *tickelli*). tbt. sin. dist. NMNHS 12389 (g); *Anorrhinus* sp. (*tickelli*). humerus sin. dist. NMNHS 12336 (h); *Anorrhinus malayanus*—humerus sin. dist. NMNHS 12337 (i,j); *Buceros* sp./*Buceros* cf. *bicornis*—femur dex. prox. NMNHS 12379 (k,l); *Anthracoceros albirostris*—coracoid omal dex. NMNHS 12344 (m); *Anthracoceros albirostris*—femur sin. prox. NMNHS 12375 (n,o); *Anthracoceros albirostris*—femur sin. prox. NMNHS 12383 (p); *Anthracoceros* cf. *albirostris*—tmt. dex. dist. NMNHS 12324 (q,r); *Anthracoceros albirostris*—vertebra thoracalis V NMNHS 12504 (s); *Anthracoceros* cf. *albirostris*—quadratum sin. NMNHS 12433 (t,u); *Aceros* sp./ (cf. *Rhyticeors undulatus*)—ulna dex. dist. NMNHS 12378 (v,w); *Rhinoplax vigil*—os premaxillae NMNHS 12481 (x–z). (Photographs: Assen Ignatov).



Figure A16. aff. *Hirundapus giganteus*—humerus sin. ad., 12569 (a,b); *Psilopogon javensis*—ulna sin. dist. NMNHS 12421 (c); *Psilopogon haemacephalus*—tbt. dex. dist., NMNHS 12422 (d); *Dendrocopos darjellensis*—mandibula, rostral part, NMNHS 12448 (e,f); *Dendrocopos darjellensis*—mandibula, rostral part, NMNHS 12449 (g,h); Picinae gen. indet.—cmc dex. prox., NMNHS 12419 (i); *Oriolus chinensis*—cmc dex. dist. NMNHS 12445 (j,k); *Dicrurus* sp.—tmt sin. NMNHS 12459 (l,m); *Corvus* sp.—humerus dex., dist. NMNHS 12513 (n); *Cissa* cf. *chinensis*—humerus sin. NMNHS 12343 (o); *Cissa thalassina*—ulna dex. dist. NMNHS 12401 (p,q); Corvidae gen.—mandibula dex. prox., NMNHS 12403 (r,s); *Trochalopteron* cf. *milnei*—scapula dex. proc. NMNHS 12440 (t); *Cinclus* aff. *pallasii*—ulna dex. prox. NMNHS 12384 (u); *Turdus pilaris*—tbt. dex. dist. NMNHS 12447 (v); *Acridotheres tristis*—ulna dex. dist. NMNHS 12402 (w); *Acridotheres* sp. (cf. *tristis*)—femur sin. prox. NMNHS 12457 (x). (Photographs: Assen Ignatov).

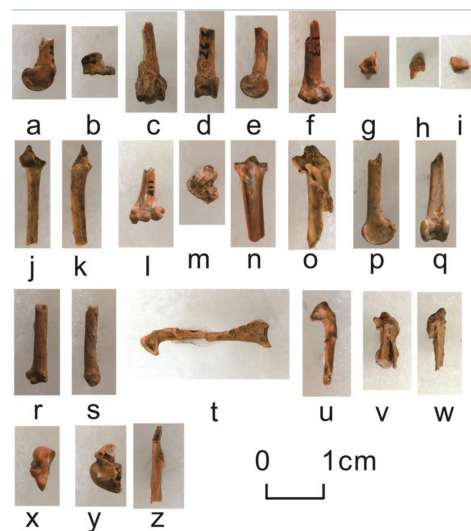


Figure A17. *Acridotheres* cf. *crisatellus*—tbt. sin. dist. NMNHS 12499 (a,b); Sturnidae gen.—tbt. sin. dist. juv. NMNHS 12318 (c); Sturnidae gen.—tbt. dex. dist. NMNHS 12385 (d,e); cf. Sturnidae gen.—humerus dex. dist. NMNHS 12372 (f); *Turdus* aff. *merula*—ulna sin. dist. NMNHS 12508 (g–i); *Turdus iliacus*—ulna sin. prox. NMNHS 12425 (j,k); *Chloropsis hardwickii*—humerus sin. dist. NMNHS 12458 (l); *Myophonus caeruleus*—tmt. sin. prox. NMNHS 12456 (m,n); *Myophonus caeruleus*—cmc. dex. prox. NMNHS 12419 (o); cf. *Myophonus* sp. (cf. *temminckii*)—tbt. sin. dist. NMNHS 12460 (p,q); *Irena puella*—ulna sin. dist. NMNHS 12444 (r,s); *Irena puella*—coracoid dex. NMNHS 12453 (t); *Irena puella*—coracoid omal dex. NMNHS 12373 (u); *Irena puella*—cmc. dex. prox. NMNHS 12387 (v); *Irena* cf. *puella*—cmc. dex. prox. NMNHS 12492 (w); *Irena* cf. *puella*—humerus sin. prox. NMNHS 12455 (x,y); *Irena* cf. *puella* coracoid omal dex. NMNHS 12417 (z). (Photographs: Assen Ignatov).

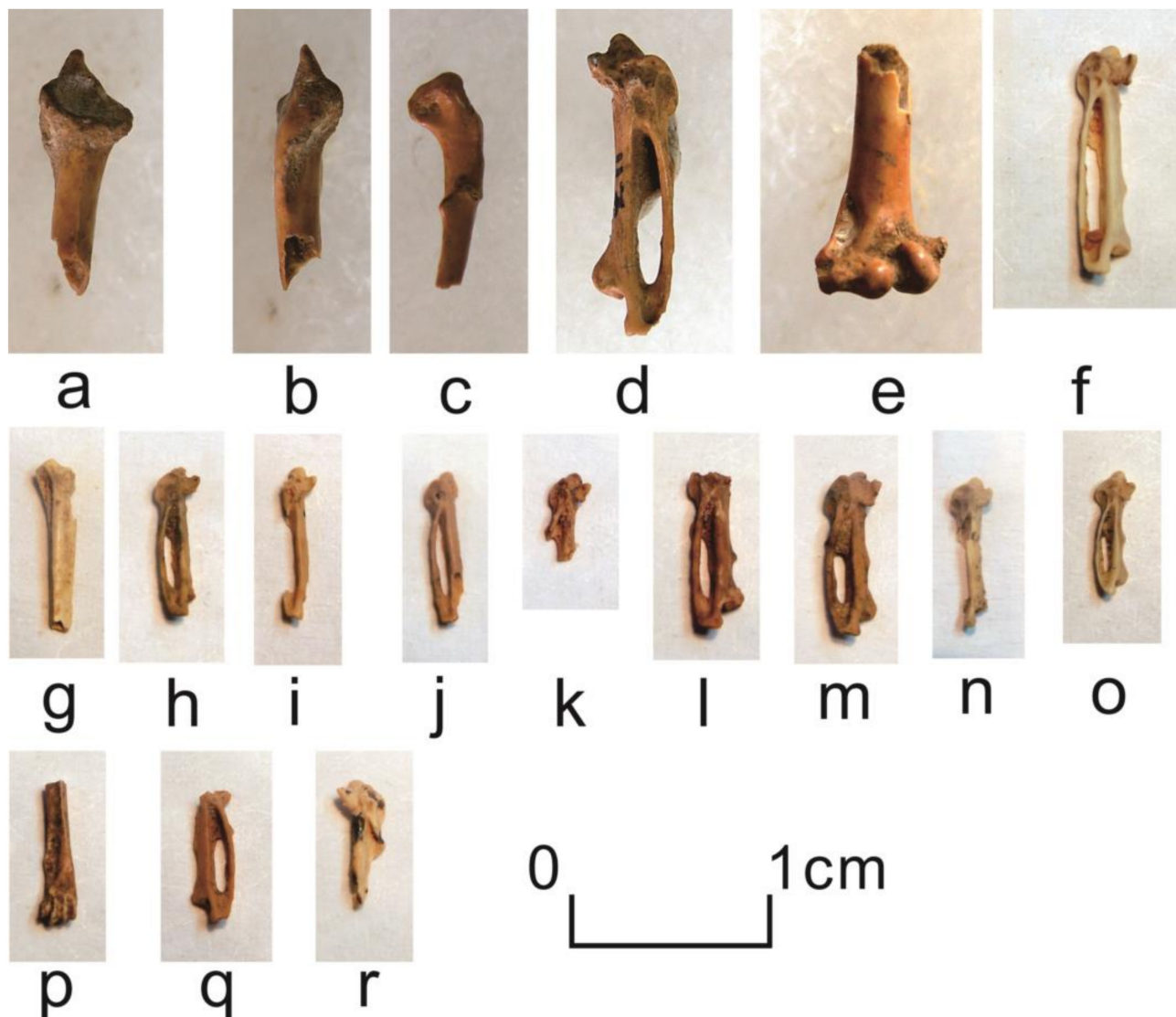


Figure A18. *Irena cf. puella*—ulna sin. prox. NMNHS 12426 (a,b); *Irena* sp.—coracoid omal dex. NMNHS 12416 (c); *Irena* sp. (excl. *I. puella*)—cmc dex. NMNHS 12454 (d); Irenidae gen. (cf. *Irena*)—humerus dex. dist. NMNHS 12371 (e); Oscines fam.—cmc sin. NMNHS 12319 (f); *Troglodytes troglodytes*—tmt dex. prox. NMNHS 12446 (g); *Troglodytes troglodytes*—cmc sin. NMNHS 12467 (h); *Troglodytes troglodytes*—cmc sin. NMNHS 12478 (i); *Troglodytes troglodytes*—cmc sin. NMNHS 12502 (j); *Troglodytes troglodytes*—cmc sin. prox. NMNHS 12506 (k); Oscines fam.—cmc sin. NMNHS 18643 (l); Oscines fam.—cmc sin. NMNHS 18641 (m); *Regulus regulus*—cmc sin. NMNHS 12479 (n); Oscines fam.—cmc sin. NMNHS 12512 (o); Non-Passeriformes fam.—tmt dex. dist. NMNHS 18640 (p); Oscines fam.—cmc dex. prox. NMNHS 12525 (q); Oscines fam.—cmc. dex. prox. NMNHS 18642 (r) (Photographs: Assen Ignatov; Zlatozar Boev).

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