

## Supplemental Appendix 5

The specimens used for coding are listed. The type specimens are indicated in bold. Anatomical abbreviations: cav, caudal vertebrae; cor, coracoid; crn, cranial elements; cmc, carpometacarpus; crn, cranial elements; cvt, cervical vertebrae; fib, fibula; fmr, femur; fur, furcula; hum, humerus; mph, manual phalanges; pat, patella; plv, pelvis (any combination of the pubis, ilium and/or ischium); pph, pedal phalanges; rad, radius; scp, scapula; stn, sternum; sys, synsacrum; tvt, thoracic vertebrae; tmt, tarsometatarsus; uln, ulna.

Taxon	Specimen ID	Material
<i>Archaeopteryx lithographica</i>	NHMUK 37007; MB. 188081	complete skeletons
<i>Protopteryx fengningensis</i>	<b>IVPP V11665</b>	complete skeletons
<i>Pengornis houi</i>	<b>IVPP V15336</b>	complete skeletons
<i>Apsaravis ukhaana</i>	<b>IGM 100/1017</b>	nearly complete skeletons
<i>Gansus yumenensis</i>	CAGS-04-CM-001, 04-CM-002, 04-CM-003, 04-CM-004, 04-CM-018, 04-CM-031, 05-CM-014, 07-CM-006, 07-CM-009, 07-CM-011	nearly complete skeletons
<i>Enaliornis sedgwicki</i>	NHMUK 479; CAMSM 55287, 55288, 55289, 55295, 55300, 55302, 55310	fmr
<i>Enaliornis sedgwicki</i>	NHMUK 480; <b>CAMSM 55314</b> , 55315; YORYMG 581	tbt
<i>Enaliornis sedgwicki</i>	NHMUK 41790; CAMSM 55320, 55320, 55332	tmt
<i>Enaliornis seeleyi</i>	CAMSM 55283	plv

<i>Enaliornis seeleyi</i>	NHMUK 484, 5801; CAMSM 55290, 55293, 55307, 55299, 55307, 55308; YORYMG 591	fmr
<i>Enaliornis seeleyi</i>	BGS 87935; NHMUK 478, 481; CAMSM 55317; YORYMG 587, 588	tbt
<i>Enaliornis seeleyi</i>	NHMUK 485a; CAMSM 55318, 55319, 55321; YORYMG 589	tmt
<i>Enaliornis barretti</i>	NHMUK 5308; YORYMG 507	cvt
<i>Enaliornis barretti</i>	CAMSM 55277	tvf
<i>Enaliornis barretti</i>	BGS 87936; NHMUK 5310; CAMSM 55282	plv
<i>Enaliornis barretti</i>	NHMUK 163, 479, 482, 483, 5305, 5306, 5803, 5805, 41792; CAMSM 5506	fmr
<i>Enaliornis barretti</i>	NHMUK 5304, 5307; CAMSM 55312, 55313, 55316; YORYMG 587	tbt
<i>Enaliornis barretti</i>	<b>NHMUK 477</b> , 5309; BGS 87932; CAMSM 55331	tmt
<i>Pasquiaornis tankei</i>	RSM P2985.10, P2986.2, P2988.1, P2988.11, P2989.21, P2995.4, P2995.5	crn
<i>Pasquiaornis tankei</i>	RSM P2626.15, P2957.16, P2957.17, P2987.13, P2987.14, P2989.24, P2997.54	cvt
<i>Pasquiaornis tankei</i>	RSM P2989.23, P2957.15, P2985.3, P2989.22	tvf
<i>Pasquiaornis tankei</i>	RSM P2997.62	sys
<i>Pasquiaornis tankei</i>	RSM P2988.9	cor
<i>Pasquiaornis tankei</i>	RSM P2997.58, 2997.59	sca
<i>Pasquiaornis tankei</i>	RSM P2077.4, 2487.4, 2995.1, 2989.11	hum

<i>Pasquiaornis tankei</i>	RSM P2831.4, 2989.34	cmc
<i>Pasquiaornis tankei</i>	RSM P2989.17, 2997.30	uln
<i>Pasquiaornis tankei</i>	RSM P2626.27, 2997.56	plv
<i>Pasquiaornis tankei</i>	RSM P2077.10, 2077.108, 2997.2, 2997.3	fmr
<i>Pasquiaornis tankei</i>	RSM P2957.22, 2957.21, 2997.44	tbt
<i>Pasquiaornis tankei</i>	RSM P2997.80	fib
<i>Pasquiaornis tankei</i>	<b>RSM P2077.63</b> , 2077.79, 2957.27	tmt
<i>Pasquiaornis tankei</i>	RSM P2989.27, 2989.41, 2997.68, 3015.9	pph
<i>Pasquiaornis hardiei</i>	RSM P2831.18, P2831.6, P2957.12, P2985.9, P2989.19	crn
<i>Pasquiaornis hardiei</i>	RSM P2831.8	cvt
<i>Pasquiaornis hardiei</i>	RSM P2626.18, P2989.25	sys
<i>Pasquiaornis hardiei</i>	RSM P2831.54	cor
<i>Pasquiaornis hardiei</i>	RSM P2985.8	sca
<i>Pasquiaornis hardiei</i>	RSM P2487.3, 2995.1, 2989.15	hum
<i>Pasquiaornis hardiei</i>	RSM P2831.20	rad
<i>Pasquiaornis hardiei</i>	RSM P2077.59, 2077.60, 2487.3, 2997.4	fmr
<i>Pasquiaornis</i>	RSM P2995.1, 2997.42, 2997.46	tbt

<i>hardiei</i> <i>Pasquiaornis</i> <i>hardiei</i> <i>Pasquiaornis</i> <i>hardiei</i>	RSM P2988.21  <b>RSM P2077.117</b> , 2997.18, 2997.81	fib  tmt
<i>Chupkaornis</i> <i>keraorum</i>	<b>MCM.A773</b>	cvt, tvt, fmr, fib
<i>Brodavis</i> <i>americanus</i>	<b>RSM P2315.1</b>	tmt
<i>Brodavis</i> <i>bairdi</i>	<b>UNSM 50665</b>	tmt
<i>Brodavis</i> <i>varneri</i>	<b>SDSM 68430</b>	cvt, tvt, fmr, fib, tbt, tmt
<i>Baptornis</i> <i>advenus</i> <i>Baptornis</i> <i>advenus</i> <i>Baptornis</i> <i>advenus</i>	AMNH 5101  FMNH 395  KUPV 2290	cvt, tvt, cav, sys, plv, tbt, tmt crn, cvt, sys, fmr, tbt, tmt, pph cvt, tvt, sys, sca, cor, hum, uln, rad, fmr, pat, tbt, fib, tmt
<i>Fumicollis</i> <i>hoffmani</i>	<b>UNSM 20030</b>	cvt, tvt, cav, cor, stn, plv, fmr, fib, tbt, tmt, pph
<i>Parahesperornis</i> <i>alexi</i> <i>Parahesperornis</i> <i>alexi</i>	<b>KUPV 2287</b>  KUPV 24090	nearly complete skeletons  cvt, tvt, cav, stn, sca, cor, fmr, tbt
<i>Hesperornis</i> <i>regalis</i> <i>Hesperornis</i> <i>regalis</i> <i>Hesperornis</i> <i>regalis</i>	<b>YPM 1200</b>  YPM 1206  YPM 1476	vrt, fmr, tbt, pat, tmt, fib, phx  nearly complete skeletons  vrt, stn, plv, fmr, pat, tbt, tmt, phx

<i>Hesperornis regalis</i>	KUVP 71012	crn, vrt, tmt
<i>Hesperornis regalis</i>	FHSM VP-2069	nearly complete skeletons
<i>Hesperornis regalis</i>	UNSM 1212	cvt, tvt, sys, plv, fmr, tmt
<i>Hesperornis gracilis</i>	<b>YPM 1473</b>	tmt
<i>Hesperornis gracilis</i>	YPM 1478	vrt, fmr, tbt, tmt, pph
<i>Hesperornis gracilis</i>	YPM 1679	rib, plv, fmr, pat, tbt, fib, tmt, pph
<i>Ichthyornis dispar</i>	<b>YPM 1450</b>	crn, stn, cor, scp, hum, uln, rad, cmc, plv, fmr, tbt, fib, tmt, pph
<i>Ichthyornis dispar</i>	YPM 1732	tvt, plv
<i>Ichthyornis dispar</i>	YPM 1733	cvt, cor
<i>Ichthyornis dispar</i>	YPM 1755	fur
<i>Ichthyornis dispar</i>	YPM 1773	scp
<i>Ichthyornis dispar</i>	YPM 1741	rad
<i>Ichthyornis dispar</i>	YPM 1724	cmc
<i>Ichthyornis dispar</i>	YPM 1463	mph
<i>Ichthyornis dispar</i>	YPM 1739	tmt
<i>Ichthyornis dispar</i>	YPM 1771	tmt

<i>Ichthyornis dispar</i>	YPM 1796	tmt
<i>Lithornis</i>	multiple specimens	nearly complete skeletons
<i>Crypturellus undulatus</i>	multiple specimens	complete skeletons
<i>Chauna torquata</i>	multiple specimens	complete skeletons
<i>Vegavis iaai</i>	<b>MLP 93-I-3-1</b>	cvt, tvf, sys, cor, sca, hum, uln, rad, plv, fmr, tbt, tmt
<i>Anas platyrhynchos</i>	multiple specimens	complete skeletons
<i>Gallus gallus</i>	multiple specimens	complete skeletons
<i>Phasianus colchicus</i>	multiple specimens	complete skeletons