



[http://app.pan.pl/SOM/app65-Holgado\\_Pegas\\_SOM.pdf](http://app.pan.pl/SOM/app65-Holgado_Pegas_SOM.pdf)

## SUPPLEMENTARY ONLINE MATERIAL FOR

### **A taxonomic and phylogenetic review of the anhanguerid pterosaur group Coloborhynchinae and the new clade Tropeognathinae**

Borja Holgado and Rodrigo V. Pêgas

Published in *Acta Palaeontologica Polonica* 2020 65 (X): xxx-xxx.

<https://doi.org/10.4202/app.00751.2020>

## SUPPLEMENTARY ONLINE MATERIAL FOR

### **Supplementary Online Material**

**Figure S1.** *Nicorhynchus capito* gen. et. comb. nov. CAMSM B54434.

**Figure S2.** *Nicorhynchus* cf. *capito* gen. et. comb. nov. NHMUK R481.

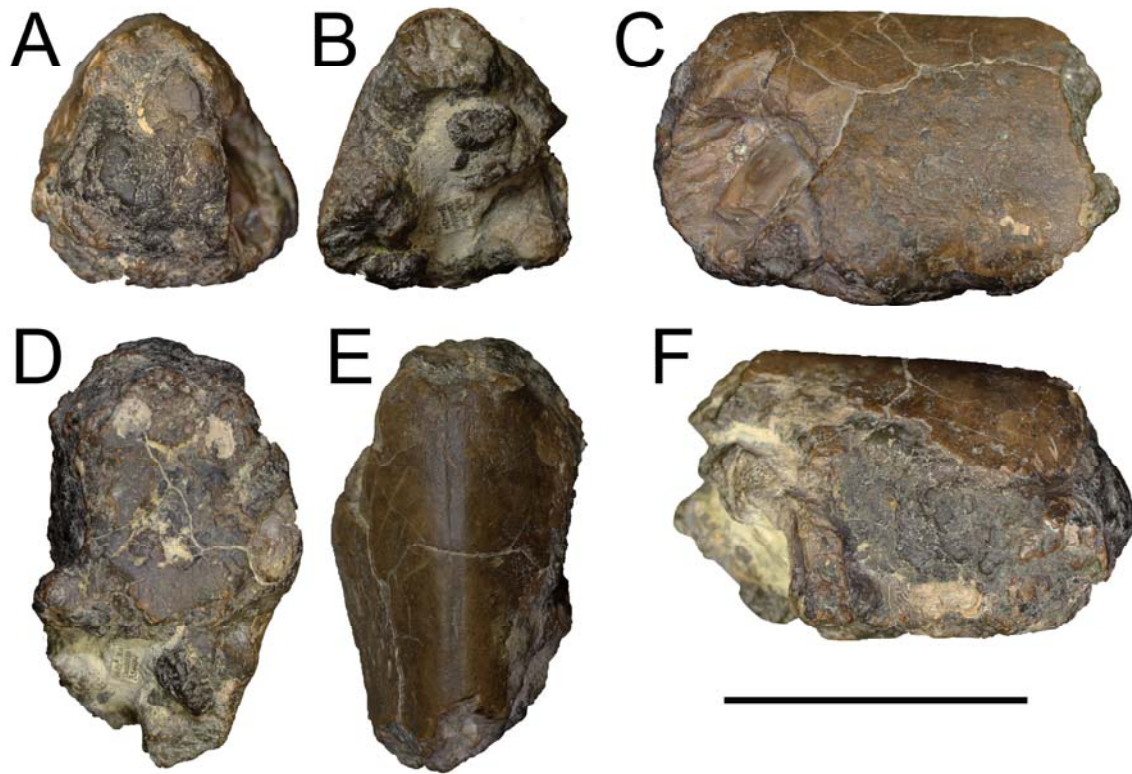
**Figure S3.** Strict consensus tree of the phylogenetic relationships of the Anhangueridae within Pterodactyloidea (Pterosauria, Ornithodira).

**Figure S4.** Coloborhynchinae indet. from the Cambridge Greensand, originally considered as *Pterodactylus woodwardi*.

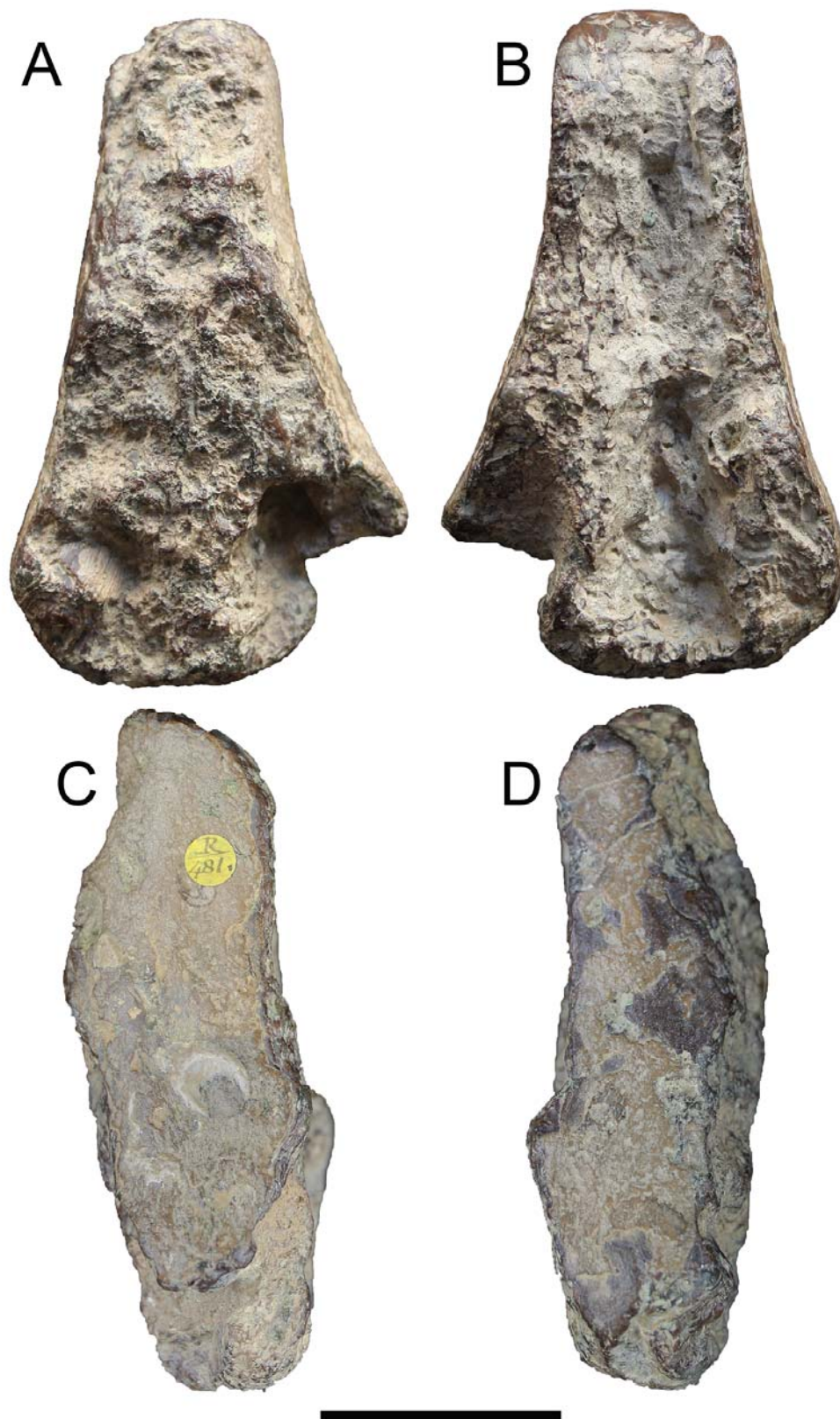
**Table S1.** Taxonomic history of the specimens considered in this work within the clade Coloborhynchinae in this work.

**Table S2.** Taxonomic history of the specimens once considered within the genus *Coloborhynchus*, but not considered within the clade Coloborhynchinae in this work (*Coloborhynchus* complex).

### **TNT data matrix**



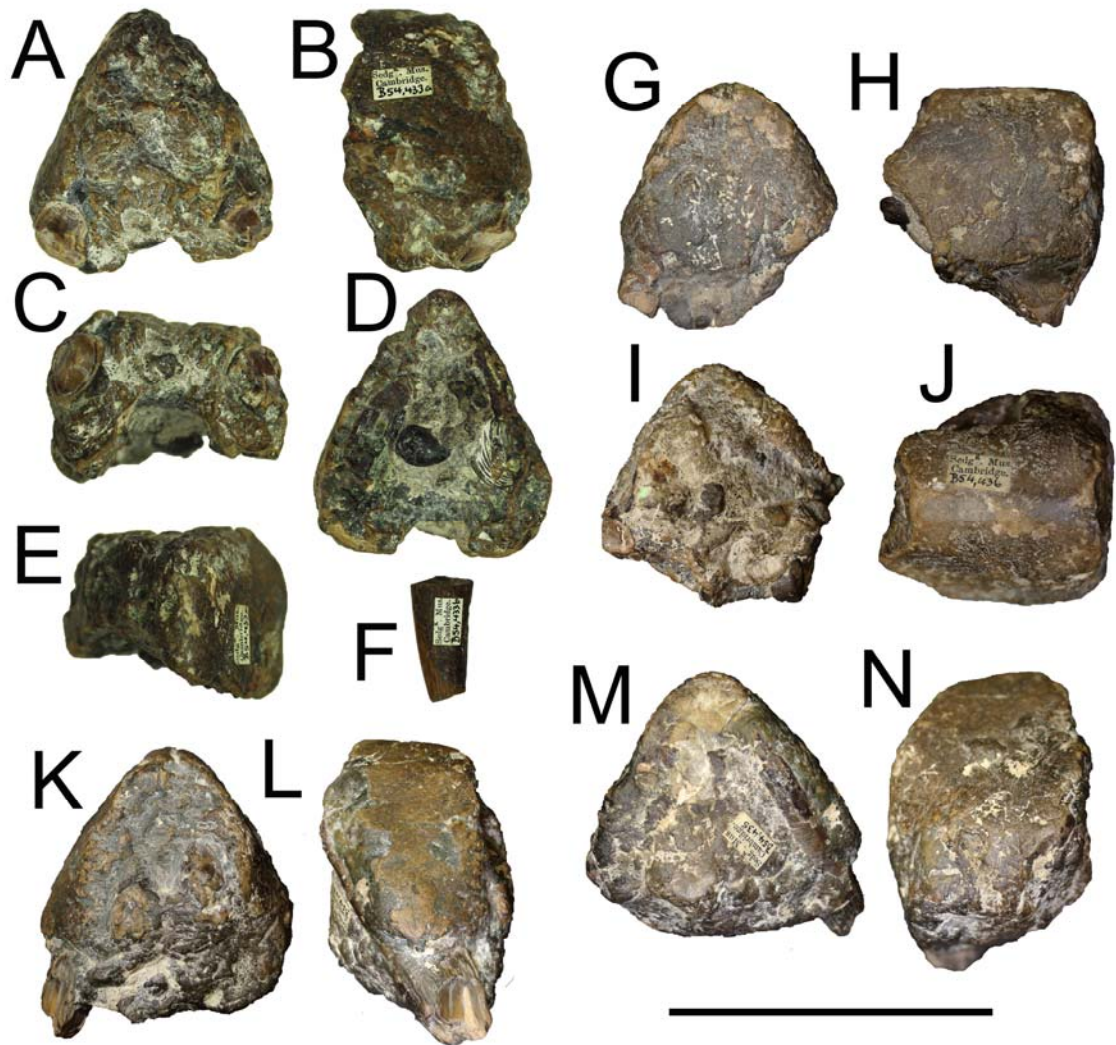
**Figure S1.** *Nicorhynchus capito* gen. et. comb. nov., CAMSM B54434. **A.** anterior view. **B.** posterior view. **C.** left lateral view. **D.** palatal view. **E.** dorsal view. **F.** right lateral view. Scale bar 50 mm. Photos by BH.



**Figure S2.** *Nicorhynchus* cf. *capito* gen. et. comb. nov., NHMUK R481. **A.** anterior view. **B.** posterior view. **C.** left lateral view. **D.** right lateral view. Scale bar 50 mm. Photos by BH.



**Figure S3.** Strict consensus tree of the phylogenetic relationships of the Anhangueridae within Pterodactyloidea (Pterosauria, Ornithodira). Node 112 = Ornithocheirae; Node 119 = Anhangueria; Node 122 = Anhanguerinae; Node 124 = Anhangueridae; Node 128 = Tropeognathinae clade nov.; Node 130 = Coloborhynchinae.



**Figure S4.** Coloborhynchinae indet. from the Cambridge Greensand, originally considered as *Pterodactylus woodwardi*. **A–F** CAMSM B54433, originally identified as the holotype of *Pterodactylus woodwardi*. **A.** anterior view. **B.** left lateral view. **C.** palatal view. **D.** posterior view. **E.** dorsal view. **F.** 2nd crown left tooth (fragmented). **G–J** CAMSM B54436. **G.** anterior view. **H.** left lateral view. **I.** posterior view. **J.** dorsal view. **K–N** CAMSM B54435. **K.** anterior view. **L.** left lateral view. **M.** posterior view. **N.** right lateral view. Scale bar 50 mm. Photos by BH.

**Table S1.** Taxonomic history of the specimens considered in this work within the clade Coloborhynchinae in this work.

Specimen	CAMSM B 54422	CAMSM B 54433	CAMSM B 54625	?	NHMUK R1822	SMU 73058	FSAC-KK 10701	NHMUK R481	IWCMS 2014.82
Original description	<i>Pterodactylus sedgwickii</i> Owen, 1859	<i>Pterodactylus woodwardi</i> Owen, 1861	<i>Ornithocheirus capito</i> Seeley, 1870	<i>Ornithocheirus reedi</i> Seeley, 1870	<i>Coloborhynchus clavirostris</i> Owen, 1874	<i>Coloborhynchus wadleighi</i> Lee, 1994	<i>Coloborhynchus fluviferox</i> Jacobs et al., 2019	-	-
Owen (1874)	<i>Coloborhynchus sedgwickii</i>	-	-	-	<i>Coloborhynchus clavirostris</i>	-	-	-	-
Hooley (1914)	<i>Ornithocheirus sedgwickii</i>	<i>Criohynchus woodwardi</i>	<i>Criohynchus capito</i>	<i>Criohynchus reedi</i>	<i>Criohynchus simus</i>	-	-	-	-
Wellnhofer (1978)	<i>Ornithocheirus sedgwickii</i>	<i>Criohynchus simus</i>	Criohynchidae <i>incertae sedis</i>	Criohynchidae <i>incertae sedis</i>	<i>Criohynchus simus</i>	-	-	-	-
Lee (1994)	<i>Ornithocheirus sedgwickii</i>	-	-	-	<i>Coloborhynchus clavirostris</i>	<i>Coloborhynchus wadleighi</i>	-	-	-
Unwin (2001)	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus capito</i>	<i>Coloborhynchus capito</i>	<i>Coloborhynchus clavirostris</i>	<i>Coloborhynchus wadleighi</i>	-	-	-
Rodrigues & Kellner (2008)	“ <i>Ornithocheirus</i> ” <i>sedgwickii</i>	-	“ <i>Ornithocheirus</i> ” <i>capito</i>		<i>Coloborhynchus clavirostris</i>	<i>Uktenadactylus wadleighi</i>	-	-	-
Martill & Unwin (2012)	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus capito</i>	<i>Coloborhynchus capito</i>	<i>Coloborhynchus clavirostris</i>	<i>Coloborhynchus wadleighi</i>	-	<i>Coloborhynchus capito</i>	-
Rodrigues & Kellner (2013)	<i>Camposipterus</i> (?) <i>sedgwickii</i>	nomem dubium	“ <i>Ornithocheirus</i> ” <i>capito</i>	“ <i>Ornithocheirus</i> ” <i>capito</i>	<i>Coloborhynchus clavirostris</i>	<i>Uktenadactylus wadleighi</i>	-	-	-
Martill (2015)	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus capito</i>	<i>Coloborhynchus capito</i>	<i>Coloborhynchus clavirostris</i>	<i>Coloborhynchus wadleighi</i>	-	-	<i>Coloborhynchus</i> sp.
Jacobs et al. (2019)	<i>Camposipterus sedgwickii</i>	-	<i>Coloborhynchus capito</i>	<i>Coloborhynchus reedi</i>	<i>Coloborhynchus clavirostris</i>	<i>Uktenadactylus wadleighi</i>	<i>Coloborhynchus fluviferox</i>	<i>Coloborhynchus</i> sp.	<i>Coloborhynchus</i> sp.
Jacobs et al. (2020)	<i>Camposipterus</i> (?) <i>sedgwickii</i>	-	<i>Coloborhynchus capito</i>	<i>Coloborhynchus reedi</i>	<i>Coloborhynchus clavirostris</i>	<i>Uktenadactylus wadleighi</i>	<i>Coloborhynchus fluviferox</i>	<i>Coloborhynchus</i> sp.	<i>Coloborhynchus</i> sp.
This work	<i>Aerodraco sedgwickii</i> comb. nov.	Coloborhynchinae indet.	<i>Nicorhynchus capito</i> comb. nov.	<i>Nicorhynchus capito</i> comb. nov.	<i>Coloborhynchus clavirostris</i>	<i>Uktenadactylus wadleighi</i>	<i>Nicorhynchus fluviferox</i> comb. nov.	<i>Nicorhynchus</i> cf. <i>capito</i> comb. nov.	<i>Uktenadactylus rodriguesae</i> sp. nov.

**Table S2.** Taxonomic history of the specimens once considered within the genus *Coloborhynchus*, but not considered within the clade Coloborhynchinae in this work (*Coloborhynchus* complex).

Specimen	NHMUK PV 39409	CAMSM B 54499	CAMSM B54644	BSPG 1982 I 89	BSPG 1987 I 47; SMNK 2302 PAL	LINHM 016	NSM-PV 19892	RGM 401 880
Original description	<i>Pterodactylus cuvieri</i> Bowerbank, 1852	<i>Ornithocheirus crassidens</i> Seeley, 1870	<i>Ornithocheirus eurygnathus</i> Seeley, 1870	<i>Santanadactylus araripensis</i> Wellnhofer, 1985	<i>Tropeognathus robustus</i> Wellnhofer, 1987	<i>Siroccopteryx moroccensis</i> Mader & Kellner, 1999	<i>Anhanguera piscator</i> Kellner & Tomida, 2000	<i>Coloborhynchus spielbergi</i> Veldmeijer, 2003
Owen (1874)	<i>Coloborhynchus cuvieri</i>	-	-	-	-	-	-	-
Hooley (1914)	<i>Ornithocheirus cuvieri</i>	<i>Amblydectes crassidens</i>	<i>Amblydectes eurygnathus</i>	-	-	-	-	-
Fastnacht (2001)	<i>Ornithocheirus cuvieri</i>	-	-	-	<i>Coloborhynchus robustus</i>	<i>Siroccopteryx moroccensis</i>	-	-
Unwin (2001)	<i>Anhanguera cuvieri</i>	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus capito</i>	-	<i>Coloborhynchus robustus</i>	<i>Coloborhynchus moroccensis</i>	<i>Anhanguera "piscator"</i>	-
Unwin (2002)	-	-	-	<i>Santanadactylus araripensis</i>	<i>Coloborhynchus robustus</i>	<i>Coloborhynchus moroccensis</i>	<i>Coloborhynchus robustus</i>	-
Veldmeijer (2003)	-	-	-	<i>Coloborhynchus araripensis</i>	<i>Coloborhynchus robustus</i>	<i>Siroccopteryx moroccensis</i>	<i>Coloborhynchus piscator</i>	<i>Coloborhynchus spielbergi</i>
Rodrigues & Kellner (2008)	" <i>Ornithocheirus</i> " <i>cuvieri</i>	-	-	<i>Anhanguera araripensis</i>	<i>Anhanguera robustus</i>	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Anhanguera spielbergi</i>
Martill & Unwin (2012)	<i>Anhanguera cuvieri</i>	<i>Coloborhynchus sedgwickii</i>	<i>Coloborhynchus capito</i>	-	<i>Coloborhynchus robustus</i>	<i>Coloborhynchus moroccensis</i>	<i>Coloborhynchus robustus</i>	<i>Coloborhynchus robustus</i>
Rodrigues & Kellner (2013)	<i>Cimoliopterus cuvieri</i>	nomem dubium	nomem dubium	<i>Anhanguera araripensis</i>	<i>Anhanguera robustus</i>	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Anhanguera spielbergi</i>
Pinheiro & Rodrigues (2017)	<i>Cimoliopterus cuvieri</i>	nomem dubium	nomem dubium	<i>Anhanguera</i> sp.	<i>Anhanguera</i> sp.	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Anhanguera spielbergi</i>
Holgado et al. (2019)	<i>Cimoliopterus cuvieri</i>	-	-	<i>Anhanguera</i> sp.	<i>Anhanguera</i> sp.	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Anhanguera spielbergi</i>
Jacobs et al. (2019)	<i>Cimoliopterus cuvieri</i>	-	-	<i>Anhanguera araripensis</i>	<i>Anhanguera robustus</i>	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Maaradactylus spielbergi</i>
Pêgas et al. (2019)	<i>Cimoliopterus cuvieri</i>	-	-	<i>Anhanguera</i> sp.	<i>Anhanguera</i> sp.	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Anhanguera spielbergi</i>
Jacobs et al. (2020)	<i>Cimoliopterus cuvieri</i>	-	-	<i>Anhanguera araripensis</i>	<i>Anhanguera robustus</i>	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Maaradactylus spielbergi</i>
This work	<i>Cimoliopterus cuvieri</i>	<i>Amblydectes crassidens</i>	<i>Amblydectes(?) eurygnathus</i>	<i>Anhanguera</i> sp.	<i>Anhanguera</i> sp.	<i>Siroccopteryx moroccensis</i>	<i>Anhanguera piscator</i>	<i>Anhanguera spielbergi</i>











Sirocopteryx\_moroccensis

????????????????00??00001000??1?0000?1000????????????????????02?1?00110000????????????????0?00000?110000100001?000100  
0??

Aerodraco\_sedgwickii\_comb.\_nov.

????????????????0????00001210????0000?000????????????????????????01?0?00110000????????????????????0111?110000?????????1000  
??

Coloborhynchus\_clavirostris

????????????????00??00001210????0000?1000????????????????????????01?0?00110000????????????????????0??1111?110000?00?????1000  
??

Uktenadactylus\_wadleighi

????????????????00??00001210????0000?0110????????????????????????01?0?01110001????????????????????0??1111?110000?00?????1000  
??

Uktenadactylus\_rodriguesae\_sp.\_nov.

????????????????0????00?012?0????????0????????????????????????????????1110001????????????????????1??0?0?????????00????  
??

Nicorhynchus\_capito\_comb.\_nov.

????????????????0????00??12?0??????00?0110????????????????????????????1??1011111????????????????????1111??0?0?????????100??  
??

Nicorhynchus\_fluviferox\_comb.\_nov.

????????????????0????00??12?0??????00?11?0????????????????????????????????10111110????????????????????1??1??0?0?????????0??  
??

;

cnames

{0 External\_naris\_(or\_nasoantorbital\_fenestra),\_position\_relative\_to\_the\_premaxilla\_main\_part\_dorsal\_to\_the\_ventral\_margin\_of\_the\_premaxilla  
main\_part\_displaced\_posterior\_to\_the\_premaxilla;

{1 External\_naris,\_dorsoventrally\_compressed absent present;

{2 External\_naris\_and\_antorbital\_fenestra\_configuration\_separated confluent,\_forming\_a\_nasoantorbital\_fenestra;

{3 External\_naris\_and\_antorbital\_fenestra\_(or\_nasoantorbital\_fenestra),\_ventral\_margin\_length\_relative\_the\_skull\_length  
shorter\_than\_40%\_of\_the\_skull\_length\_longer\_than\_40%\_of\_the\_skull\_length;

{4 Antorbital\_(or\_nasoantorbital)\_fenestra,\_posterior\_margin\_shape\_straight\_concave\_;

{5 Nasoantorbital\_(or\_antorbital)\_fenestra\_extending\_dorsal\_to\_the\_orbit\_absent present;

{6 Orbit\_shape\_subcircular quadrangular\_(broad\_base) piriform\_(dorsoventrally\_elongated)\_;

{7 Orbit,\_comparatively\_small absent\_present\_;

{8 Ventral\_margin\_of\_the\_orbit closed open;

{9 Orbit,\_position

middle\_of\_the\_skull,\_with\_the\_ventral\_margin\_of\_the\_orbit\_below\_the\_middle\_of\_the\_antorbital\_(or\_nasoantorbital)\_fenestra\_and\_the\_dorsal\_margin\_of\_t

he\_orbit\_above\_the\_dorsal\_margin\_of\_the\_antorbital\_(or\_nasoantorbital)\_fenestra  
high\_in\_the\_skull,\_with\_the\_dorsal\_margin\_of\_the\_orbit\_surpassing\_the\_level\_of\_the\_nasoantorbital\_fenestra  
low\_in\_the\_skull,\_with\_the\_entire\_orbit\_lower\_than\_the\_dorsal\_margin\_of\_the\_antorbital\_(or\_nasoantorbital)\_fenestra;  
{10 Suborbital\_opening absent\_present\_;  
{11 Lower\_temporal\_fenestra,\_shape comparatively\_broad,\_with\_extensive\_subhorizontal\_ventral\_margin  
piriform,\_with\_dorsal\_portion\_wider\_than\_ventral\_\_piriform,\_with\_ventral\_portion\_wider\_than\_dorsal\_reduced\_(slit-like);  
{12 Lower\_temporal\_fenestra,\_position\_relative\_to\_orbit posterior\_to\_orbit\_reaches\_under\_posterior\_margin\_of\_orbit;  
{13 Choanae,\_separation separated\_by\_vomer confluent;  
{14 Postpalatine\_fenestra,\_shape quadrangular/subtriangular\_oval\_egg-shaped\_elongated\_egg-shaped\_kite-shaped,\_rounded\_margin\_elliptical\_reduced,\_slit-like;  
{15 Secondary\_subtemporal\_fenestra absent\_present;  
{16 Interpterygoid\_fenestra,\_size smaller\_than\_subtemporal\_fenestra\_larger\_than\_subtemporal\_fenestra\_extremely\_reduced;  
{17 Interpterygoid\_fenestra,\_shape compressed\_laterally\_broad,\_longer\_than\_wide compressed\_anteroposteriorly,\_wider\_than\_long\_round;  
{18 Pterygoid\_fenestra absent\_present;  
{19 Upper\_and\_lower\_jaw,\_marked\_gap\_during\_occlusion absent\_present;  
{20 Upper\_and\_lower\_jaw,\_shape laterally\_compressed\_comparatively\_broad\_;  
{21 Upper\_and\_lower\_jaw,\_anterior\_half,\_margins\_in\_occlusal\_view continuous\_taper\_subparallel;  
{22 Skull,\_main\_part\_of\_dorsal\_margin,\_curvature\_excluding\_cranial\_crest nearly\_straight\_concave\_convex;  
{23 Skull,\_height,\_exclusive\_of\_cranial\_crests under\_25%\_jaw\_length\_over;  
{24 Length\_of\_the\_rostrum\_(pm-naof)\_relative\_to\_the\_skull\_length\_(pm-sq) reduced,\_under\_20%\_elongated,\_between\_20\_and\_50%  
extremely\_elongated\_(more\_than\_half\_of\_skull\_length);  
{25 Rostrum,\_anterior\_end,\_shape blunt\_pointed\_sharp\_tip;  
{26 Rostrum,\_anterior\_end,\_small\_blunt\_anterior\_projection\_above\_first\_teeth\_pair;  
{27 Rostral\_end\_of\_premaxillae/maxillae\_downturned absent\_present\_;  
{28 Rostrum,\_distinct\_concavity\_on\_occlusal\_surface absent\_present;  
{29 Premaxilla,\_anterior\_expansion;  
{30 Premaxilla,\_anterior\_expansion,\_lateral\_margins rounded\_straight,\_subparallel;  
{31 Premaxilla,\_anterior\_expansion,\_width\_relative\_to\_post-rossette\_width Under\_130% Between\_130%\_and\_140% Over\_140%;  
{32 Premaxillae,\_anterior\_end\_rodlike absent\_present;  
{33 Premaxillary\_process\_separating\_the\_external\_nares,\_thickness\_wide\_narrow\_;  
{34 Premaxilla,\_posterodorsal\_margin\_of\_nasoantorbital\_fenestra\_(including\_nasal),\_width\_wide\_thin;  
{35 Premaxillary\_sagittal\_crest;  
{36 Premaxillary\_sagittal\_crest\_position confined\_to\_the\_anterior\_portion\_of\_the\_skull\_  
starting\_anterior\_to\_the\_anterior\_margin\_of\_the\_nasoantorbital\_fenestra,\_extending\_beyond\_occipital\_region  
starting\_at\_about\_the\_anterior\_margin\_of\_the\_nasoantorbital\_fenestra,\_reaching\_the\_skull\_roof\_above\_the\_orbit\_but\_not\_extending\_over\_the\_occipital\_regi  
on\_starting\_close\_or\_at\_the\_anterior\_portion\_of\_the\_skull\_and\_extended\_over\_the\_occipital\_region

starting\_at\_the\_posterior\_half\_of\_the\_nasoantorbital\_fenestra  
starting\_at\_the\_middle\_part\_of\_the\_nasoantorbital\_fenestra\_and\_extended\_over\_the\_occipital\_region absent;  
{37 Premaxillary\_sagittal\_crest,\_shape striated,\_low\_with\_a\_nearly\_straight\_dorsal\_margin striated,\_high\_with\_a\_nearly\_straight\_dorsal\_margin  
round\_dorsal\_margin,\_bladeshaped smooth,\_expanded\_anteriorly\_and\_forming\_a\_low\_rod-like\_extension\_posteriorly  
smooth,\_starting\_low\_anteriorly\_and\_very\_expanded\_posteriorly striated,\_low,\_convex\_dorsal\_margin;  
{38 Premaxillary\_crest,\_elongated\_dorsal\_premaxillary\_spike-like\_projection\_ absent\_ present\_;  
{39 Premaxillary\_crest,\_distinct\_expansion\_on\_the\_anterior\_part\_ absent present;  
{40 Premaxillary\_crest,\_concentric\_striae\_on\_the\_anterior\_region;  
{41 Premaxillary\_crest,\_anterior\_expansion\_of\_the\_anterior\_margin;  
{42 Premaxilla,\_posterior\_dorsal\_process,\_curved\_upward absent present;  
{43 Premaxillary\_blade-like\_crest,\_position posterior\_to\_rostral\_tip at\_rostral\_tip;  
{44 Premaxillary\_blade-likecrest,\_dorsal\_margin\_of\_rostrum\_connecting\_to\_crest\_(REESCREVER) round/keeled broad,\_flat/grooved;  
{45 Premaxillary\_blade-like\_crest,\_anterior\_margin\_of\_crest\_strongly\_concave absent present;  
{46 Premaxillary\_blade-like\_crest,\_anterior\_base\_thickness;  
{47 Maxilla,\_posterior\_ventral\_expansion\_ absent\_ present\_;  
{48 Maxilla-nasal\_contact;  
{49 Maxilla-nasal\_contact,\_broadness broad narrow absent;  
{50 Nasal\_descending\_process;  
{51 Nasal\_descending\_process,\_position\_ placed\_laterally placed\_medially absent;  
{52 Nasal\_descending\_process,\_length\_long\_(almost\_reaching\_the\_ventral\_margin\_of\_the\_skull) short knob-like\_(extremely\_reduced);  
{53 Nasal\_descending\_process,\_orientation\_ inclined\_anteriorly subvertical absent;  
{54 Nasal\_descending\_process,\_lateral\_foramen\_ absent\_ present\_;  
{55 Lacrimal,\_extensive\_fenestration absent\_ present\_;  
{56 Lacrimal,\_orbital\_process\_ absent\_ present\_;  
{57 Jugal,\_lacrimal\_process\_base,\_width\_ broad narrow;  
{58 Jugal,\_lacrimal\_process,\_inclination\_ inclined\_anteriorly subvertical inclined\_posteriorly;  
{59 Jugal,\_presence\_of\_pronounced\_ridge\_on\_the\_lateral\_side absent present;  
{60 Jugal,\_posterior\_process,\_orbital\_process absent present;  
{61 Quadrate,\_inclination\_relative\_to\_ventral\_margin\_of\_skull\_ anteriorly subvertical inclined\_about\_120°\_posteriorly inclined\_about\_120°\_backwards\_  
inclined\_about\_150°\_posteriorly;  
{62 Cranio-mandibular\_articulation,\_position\_relative\_to\_orbit\_ \_posterior\_to\_posterior\_margin\_of\_orbit under\_center\_of\_orbit\_  
under\_anterior\_margin\_of\_the\_orbit anterior\_to\_anterior\_margin\_of\_orbit;  
{63 Helical\_jaw\_joint absent\_ present\_;  
{64 Frontal,\_anterior\_portion\_rugose absent present;  
{65 Frontal,\_ossified\_crest;  
{66 Frontal,\_ossified\_crest,\_position\_ confined\_to\_posterior\_end\_of\_skull starting\_above\_orbit starting\_on\_\_posterior\_half\_of\_nasoantorbital\_fenestra;

{67 Frontal,\_ossified\_crest,\_shape low,\_blunt short.\_spike-like,\_dorsally\_deflected spike-like,\_directed\_posteriorly narrow,\_broad,\_directed\_posteriorly low,\_broad\_base,\_fans-shaped high,\_broad\_base,\_crown-shaped high,\_broad\_base,\_casqued-shaped high,\_broad,\_directed\_posteriorly,\_at\_least\_doubling\_shight\_of\_skull\_above\_orbit absent;

{68 Parietal,\_ossified\_crest;

{69 Parietal,\_ossified\_crest,\_shape\_blunt\_constituting\_the\_base\_of\_the\_posterior\_portion\_of\_the\_cranial\_crest expanded,\_with\_rounded\_margin;

{70 Posterior\_region\_of\_the\_skull\_rounded\_with\_the\_squamosal\_displaced\_ventrally absent\_present\_;

{71 Supraoccipital\_does\_not\_extend\_backwards\_extends\_backwards\_;

{72 Supraoccipital,\_foramen\_absent\_present\_;

{73 Paroccipital\_processes,\_expanded\_distal\_ends\_absent\_present\_;

{74 Foraminae\_piercing\_the\_anterior\_portion\_of\_the\_palate,\_numerous absent\_present;

{75 Palate,\_occlusal\_surface smooth discrete\_palatal\_ridge,\_tapering\_anteriorly\_strong\_palatal\_ridge,\_tapering\_anteriorly strong\_palatal\_ridge,\_confined\_to\_the\_posterior\_portion\_of\_the\_palate;

{76 Palate,\_palatal\_ridge,\_reducing\_posteriorly absent\_present;

{77 Palate,\_palatal\_ridge,\_position\_anterior\_to\_fifth\_tooth\_position posterior\_to\_fifth\_tooth\_position;

{78 Palate,\_slight\_expansion\_close\_to\_the\_anterior\_margin\_of\_the\_nasoantorbital\_(or\_naris+\_antorbital)\_fenestra absent\_present;

{79 Palate,\_depression\_posterior\_to\_second\_tooth;

{80 Palate,\_bulbous\_projection\_between\_the\_second\_alveolar\_pair absent\_present;

{81 Palatal\_tip,\_dorsal\_deflection absent\_present,\_with\_first\_alveoli\_pair\_not\_surpassing\_second\_one present,\_with\_first\_alveoli\_pair\_surpassing\_second\_one;

{82 Palatal\_tip,\_dorsal\_deflection,\_angle\_relative\_to\_remaining\_palatal\_plane under\_90° 90°;

{83 Deltoid\_facet,\_height\_relative\_to\_width height\_subequal\_to\_or\_lower\_than\_width higher\_than\_wide;

{84 Deltoid\_facet,\_dorsolateral\_edges smooth anterior\_ridges;

{85 Deltoid\_facet,\_anteroventral\_depression\_reaching\_ventral\_palatal\_surface absent\_present;

{86 Deltoid\_facet,\_round\_depression\_above\_first\_pair\_of\_alveoli absent\_present;

{87 Maxilla\_and\_internal\_naris,\_contact\_absent\_present\_;

{88 Palatines,\_shape\_broad thin\_bars;

{89 Basisphenoid\_body,\_length\_shorter\_than\_wide longer\_than\_wide;

{90 Mandibular\_rostral\_end,\_opposing\_dentaries\_unfused fused;

{91 Mandibular\_rostral\_end,\_extension\_of\_the\_contact\_surface\_of\_opposing\_dentaries\_short,\_limited\_to\_the\_tip short,\_extended\_posteriorly\_less\_than\_30%\_of\_mandible\_length long,\_up\_to\_55%\_the\_mandible\_length long,\_extended\_over\_55%\_of\_mandible\_length;

{92 Mandibular\_rostral\_end,\_shape rounded pointed sharp\_tip;

{93 Dentary\_symphysis,\_laterolateral\_compression\_relative\_to\_alveolar\_diameter over\_3\_times\_alveolar\_diameter subequal\_to\_3\_times\_alveolar\_diameter;

{94 Dentary\_symphysis,\_occlusal\_groove,\_anterior\_extension posterior\_to\_second\_tooth\_pair reaching\_first\_tooth\_pair,\_but\_not\_the\_rostral\_tip reaching\_rostral\_tip;

{95 Dentary\_symphysis,\_rims\_of\_occlusal\_groove,\_lateral\_view,\_dorsal\_heigth level\_with\_alveolar\_borders conspicuously\_raised\_above\_alveolar\_level;

{96 Dentary,\_dorsal\_margin,\_distinct\_posterior\_eminence\_close\_to\_the\_separation\_of\_mandibular\_rami absent\_present;

{97 Dentary,\_tip,\_projected\_anteriorly absent\_present\_;

{98 Dentary, \_tip, \_odontoid\_process;  
{99 Dentary\_ossified\_sagittal\_crest;  
{100 Dentary\_ossified\_sagittal\_crest, \_position\_confined\_to\_the\_anterior\_third\_of\_the\_lower\_jaw extending\_close\_to\_the\_middle\_portion\_of\_the\_lower\_jaw;  
{101 Dentary\_ossified\_sagittal\_crest, \_shape\_shallow blade-like deep, \_broad\_in\_lateral\_view elongated\_ridge absent;  
{102 Dentary, \_posteroventral\_fossa absent present;  
{103 Teeth, \_position\_and\_presence present, \_evenly\_distributed\_along\_the\_jaws\_teeth\_absent\_from\_the\_anterior\_portion\_of\_the\_jaws\_confined\_to\_the\_anterior\_half\_of\_the\_jaws confined\_to\_the\_anterior\_third\_of\_the\_jaws jaws\_toothless;  
{104 Maxillary\_teeth, \_largest\_positioned\_posteriorly\_ absent\_present\_;  
{105 Teeth, \_shape\_variation isodont heterodont;  
{106 Teeth, \_anterior\_positions\_(first\_through\_fourth), \_crown\_height\_over\_four\_times\_diameter;  
{107 Teeth, \_upper\_jaw, \_second\_pair, \_position\_in\_horizontal\_plane medial\_to\_third\_pair aligned\_with\_third\_pair;  
{108 Teeth, \_upper\_jaw, \_3rd\_pair\_of\_teeth\_double\_size\_than\_4th\_pair absent present;  
{109 Teeth, \_upper\_jaw, \_5th\_pair\_of\_teeth\_medially\_displaced absent present;  
{110 Teeth, \_upper\_jaw, \_first\_pair\_of\_slender\_elongated\_teeth, \_cross-section subcircular elliptical;  
{111 Teeth, \_lower\_jaw, \_first\_pair\_of\_teeth\_enlarged;  
{112 Teeth, \_both\_jaws, \_third\_tooth\_larger\_than\_fourth;  
{113 Teeth, \_anterior, \_marked\_variation\_in\_width absent present;  
{114 Teeth, \_spacing, \_first\_pair\_separated\_by\_a\_thin\_sheet\_of\_bone\_(less\_than\_half\_the\_alveolous\_width);  
{115 Teeth, \_spacing, \_first\_three\_pairs\_more\_closely\_spaced\_than\_subsequent\_teeth;  
{116 Teeth, \_upper\_jaw, \_variation\_in\_the\_size\_of\_the\_anterior\_teeth\_with\_the\_5th\_and\_6th\_smaller\_than\_the\_4th absent\_present\_;  
{117 Teeth, \_base\_broad\_and\_oval absent\_present\_;  
{118 Teeth, \_serrated present absent;  
{119 Teeth, \_peg-like\_(cone-shaped) absent\_present, \_15\_or\_less\_on\_each\_side\_of\_the\_upper\_jaws present, \_more\_than\_15\_on\_each\_side\_of\_the\_upper\_jaws;  
{120 Teeth, \_small\_needle-shaped absent present;  
{121 Teeth, \_lateral\_compression absent present, \_moderate present, \_strong;  
{122 Teeth, \_sharp\_carinae absent present;  
{123 Teeth, \_anterior\_positions, \_relative\_elongation under\_twice\_as\_wide over\_twice\_as\_wide, \_under\_4x\_as\_wide over\_4x\_as\_wide;  
{124 Teeth, \_striated;  
{125 Teeth, \_crowns, \_with\_labial\_and\_lingual\_depressions absent present;  
{126 Teeth, \_labial/lingual\_view, \_mesiodistal\_constriction\_between\_crown\_and\_root absent present;  
{127 Teeth, \_cingulum;  
{128 Alveoli, \_prominently\_scalloped;  
{129 Alveoli\_borders, \_strongly\_raised;  
{130 Alveoli, \_lateral\_platform absent present;  
{131 Alveoli, \_toothline, \_curvature\_between\_upper\_alveoli\_4\_and\_8;  
{132 Atlas\_and\_axis unfused\_fused\_;



{133 Cervical\_vertebrae,\_postexapophyses\_absent\_present\_;

{134 Mid-cervical\_vertebrae,\_centrum,\_lateral\_foramen\_absent\_present\_;

{135 Mid-cervical\_vertebrae,\_length\_short,\_sub-equal\_in\_length\_longer\_than\_wide,\_with\_length\_less\_than\_3\_times\_width  
elongated,\_with\_length\_more\_than\_3\_times\_width\_extremely\_elongate;

{136 Mid-cervical\_vertebrae,\_ribs\_present\_absent\_;

{137 Mid-cervical\_vertebrae,\_neural\_spines,\_height\_tall\_low\_extremely\_reduced\_or\_absent;

{138 Mid-cervical\_vertebrae,\_neural\_spines,\_shape\_blade-shaped\_spike-shaped\_ridge;

{139 Notarium\_absent\_present\_;

{140 Caudal\_vertebrae,\_quantity\_more\_than\_15\_15\_or\_less\_;

{141 Caudal\_vertebrae,\_zygapophyses\_forming\_rod-like\_ossified\_processes\_absent\_present;

{142 Proximal\_caudal\_vertebrae\_centrum,\_centrum\_shape\_single\_double;

{143 Scapula,\_length\_relative\_to\_coracoid\_length\_subequal\_or\_longer\_than\_coracoid\_scapula\_shorter\_than\_coracoid\_(1\_>\_sca/cor\_>\_0.80)\_  
substantially\_shorter\_than\_coracoid\_(sca/cor\_<\_0.80);

{144 Scapula,\_proximal\_end\_elongated\_sub-oval\_;

{145 Scapula,\_shape\_elongated\_stout,\_with\_constructed\_shaft\_;

{146 Coracoid,\_proximal\_end,\_shape\_flattened\_oval\_;

{147 Coracoid,\_sternal\_articulation\_no\_developed\_articulation\_articulation\_surface\_straight\_or\_slightly\_concave\_articulation\_surface\_strongly\_concave;

{148 Coracoid,\_sternal\_articulation,\_posterior\_expansion\_absent\_present;

{149 Coracoid,\_ventral\_margin,\_deep\_flange\_absent\_present;

{150 Coracoid,\_broad\_tubercle\_on\_ventroposterior\_margin\_absent\_present;

{151 Cristospine,\_shape\_absent\_shallow\_and\_elongated\_deep\_and\_short;

{152 Humerus,\_proportional\_length\_relative\_to\_the\_metacarpal\_IV\_(hu/mcIV)\_ hu/mcIV\_>\_2.50\_ 1.50\_<\_hu/mcIV\_<\_2.50\_ 0.40\_<\_hu/mcIV\_<\_1.50  
hu/mcIV\_<\_0.40;

{153 Humerus,\_proportional\_length\_relative\_to\_the\_femur\_(hu/fe)\_ hu/fe\_<0.80\_ 1.4\_>\_hu/fe\_>\_0.80\_ hu/fe\_>\_1.40;

{154 Humerus\_plus\_ulna,\_proportional\_lengths\_relative\_to\_the\_femur\_plus\_tibia\_(hu+ul/fe+ti)\_  
humerus\_plus\_ulna\_about\_0.80%\_or\_less\_of\_femur\_plus\_tibia\_length\_(hu+ul/fe+ti\_<\_0.80)\_  
humerus\_plus\_ulna\_larger\_than\_0.80%\_of\_femur\_plus\_tibia\_length\_(hu+ul/fe+ti\_>\_0.80)\_;

{155 Humerus,\_proximal\_end,\_small\_foramen\_on\_dorsal\_surface\_distal\_to\_proximal\_articulation\_absent\_present;

{156 Humerus,\_proximal\_end,\_foramen\_on\_ventral\_surface\_close\_to\_proximal\_margin\_absent\_present\_;

{157 Humerus,\_deltopectoral\_crest,\_shape\_reduced,\_positioned\_close\_to\_the\_humerus\_shaft  
enlarged,\_proximally\_placed,\_with\_almost\_straight\_proximal\_margin\_enlarged,\_hatchet\_shaped,\_proximally\_placed  
enlarged,\_hatched\_shaped,\_positioned\_further\_down\_the\_humerus\_shaft\_enlarged,\_warped\_long,\_proximally\_placed,\_curving\_ventrally  
enlarged,\_square\_outline;

{158 Humerus,\_medial\_(=ulnar)\_crest\_reduced\_directed\_posteriorly\_massive,\_with\_a\_developed\_proximal\_ridge;

{159 Humerus,\_distal\_articulation,\_shape\_oval\_or\_D-shaped\_subtriangular\_;

{160 Humerus,\_between\_distal\_condyles,\_pneumatic\_foramen;

```

{161 Ulna,_proportional_length_relative_to_metacarpal_IV_(ul/mcIV)_ulna_3.6_times_longer_than_metacarpal_IV_(ul/mcIV_>_3.6)_
length_of_ulna_between_3.6_and_two_times_the_length_of_metacarpal_IV_(3.6_>ul/mcIV>2)_
ulna_between_double_and_the_same_length_of_metacarpal_IV_(2>ul/mcIV>1)ulna_the_same_size_or_smaller_than_metacarpal_IV_(ul/mcIV_<_1);
{162 Ulna_and_radius,_diameter_at_midshaft_subequal_diameter_of_radius_about_half_that_of_ulna_diameter_of_radius_less_than_half_that_of_ulna;
{163 Proximal_syncarpal,_large_posterodistal_process;
{164 Proximal_syncarpal,_shape_(proximal_view)quadrangular_or_irregular_pentagonal;
{165 Distal_syncarpals,_shape_(distal_view)_irregular_form_rectangular_unit_form_triangular_unit;
{166 Pteroid_absent_shorter_than_half_the_length_of_the_ulna_longer_than_half_the_length_of_the_ulna;
{167 Pteroid,_proximal_articulation,_expanded_in_right_angle_with_shaft_absent_present;
{168 Metacarpals_I_-_III,_relation_with_carpus_articulating_with_carpus_metacarpal_I_articulates_with_carpus,_metacarpals_II_and_III_reduced_
not_articulating_with_carpus;
{169 Manual_digit_IV_first_phalanx,_proportional_length_relative_to_metacarpal_IV_(ph1d4/mcIV)_both_small_and_reduced_ph1d4/mcIV>4.0
4.0>ph1d4/mcIV>2.0'2.0>_ph1d4/mcIV>1.0'ph1d4/mcIV<_1.0';
{170 Manual_digit_IV_first_phalanx,_proportional_length_relative_to_tibiotarsus_(ph1d4/ti)_ph1d4_reduced_
ph1d4_elongated_and_less_than_twice_the_length_of_ti_(ph1d4/ti_smaller_than_2.00)
ph1d4_elongated_about_or_longer_than_twice_the_length_of_ti_(ph1d4/ti_subequal/larger_than_2.00);
{171 Manual_digit_IV_second_phalanx,_proportional_length_relative_to_first_phalanx_(ph2d4/ph1d4)_both_short_or_absent_
elongated_with_second_phalanx_about_the_same_size_or_longer_than_first_(ph2d4/ph1d4_larger_than_1.00)_
elongated_with_second_phalanx_up_to_30%_shorter_than_first_(ph2d4/ph1d4_between_0.70_-_1.00)
elongated_with_second_phalanx_more_than_30%_shorter_than_first_(ph2d4/ph1d4_smaller_than_0.70);
{172 Manual_digit_IV_third_phalanx,_proportional_length_relative_to_first_phalanx_(ph3d4/ph1d4)_both_short_or_absent_
ph3d4_about_the_same_length_or_larger_than_ph1d4_ph3d4_shorter_than_ph1d4;
{173 Manual_digit_IV_third_phalanx,_proportional_length_relative_to_the_second_phalanx_(ph3d4/ph2d4)_both_short_or_absent_
ph3d4_about_the_same_size_or_longer_than_ph2d4_ph3d4_shorter_than_ph2d4;
{174 Proportional_length_of_the_forth_phalanx_of_manual_digit_IV_relative_to_the_first_phalanx_of_manual_digit_IV_(ph4d4/ph1d4)
both_short_or_absent_both_elongated,_with_the_forth_phalanx_longer_than_the_first_(ph4/d4>1.00)
both_elongated,_with_the_forth_phalanx_the_same_length_or_shorter,_but_longer_than_35%_the_lenght_of_the_first
both_elongated,_with_the_forth_phalanx_less_than_35%_the_lenght_of_the_first;
{175 Femur,_length_relative_to_metacarpal_IV_length_(fe/mcIV)_femur_at_least_twice_the_metacarpal_IV_length_(fe_?_mcIV_>_2.00)
femur_longer_but_less_than_twice_the_length_of_metacarpal_IV_(1.00_<_fe/mcIV_<_2.00)_
femur_about_the_same_length_or_shorter_than_metacarpal_IV_(fe/mcIV_<_1.00);
{176 Metatarsal_III,_proportional_length_relative_to_tibia_length_more_than_30%_of_tibia_length_less_than_30%_of_tibia_length_;
{177 Pedal_digit_V,_number_of_phalanges_with_four_phalanges_with_2_phalanges_with_1_or_no_phalanx_(extremely_reduced);
{178 Pes,_second_phalanx_of_digit_V,_shape_reduced_or_absent_elongated,_straight_elongated,_curved_elongated,_very_curved_(boomerang_shape);
;

```

proc /;