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SUPPLEMENTARY ONLINE MATERIAL FOR

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

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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

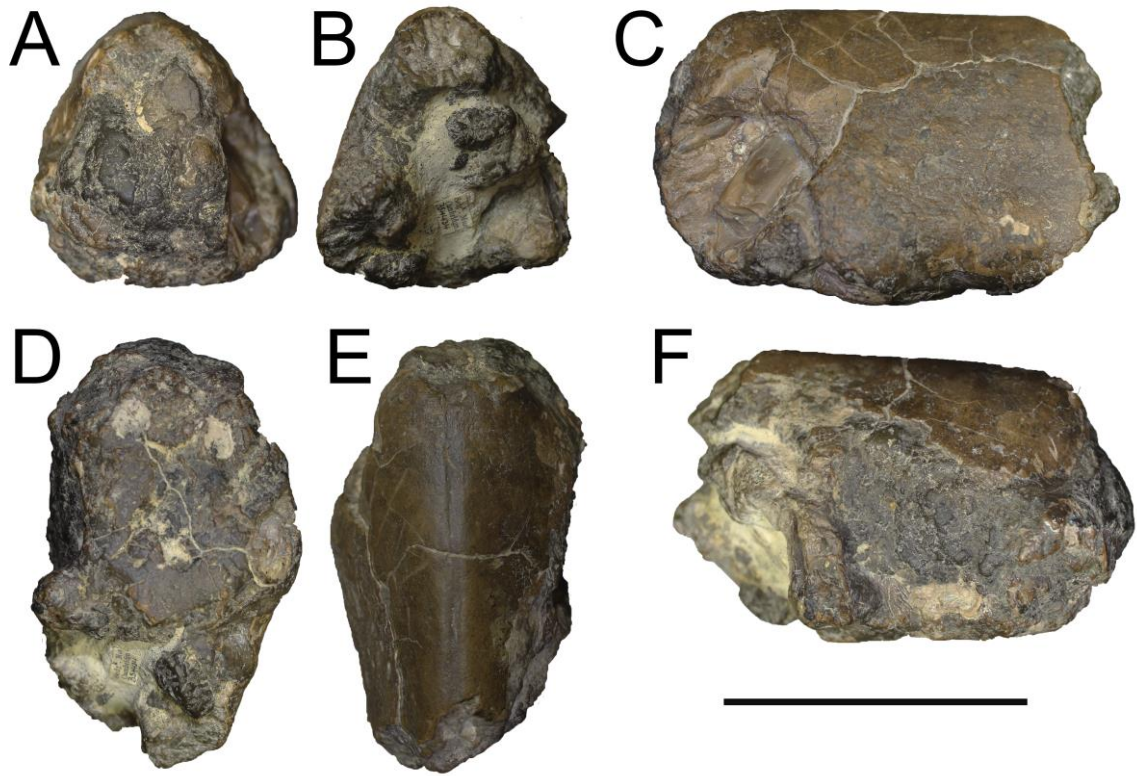


Figure S1. *Nicorhynchus capito* gen. et. comb. nov., CAMSM B54434. **A.** anterior view. **B.** posterior view. **C.** left lateral view. **D.** palatal view. **E.** dorsal view. **F.** right lateral view. Scale bar 50 mm. Photos by BH.

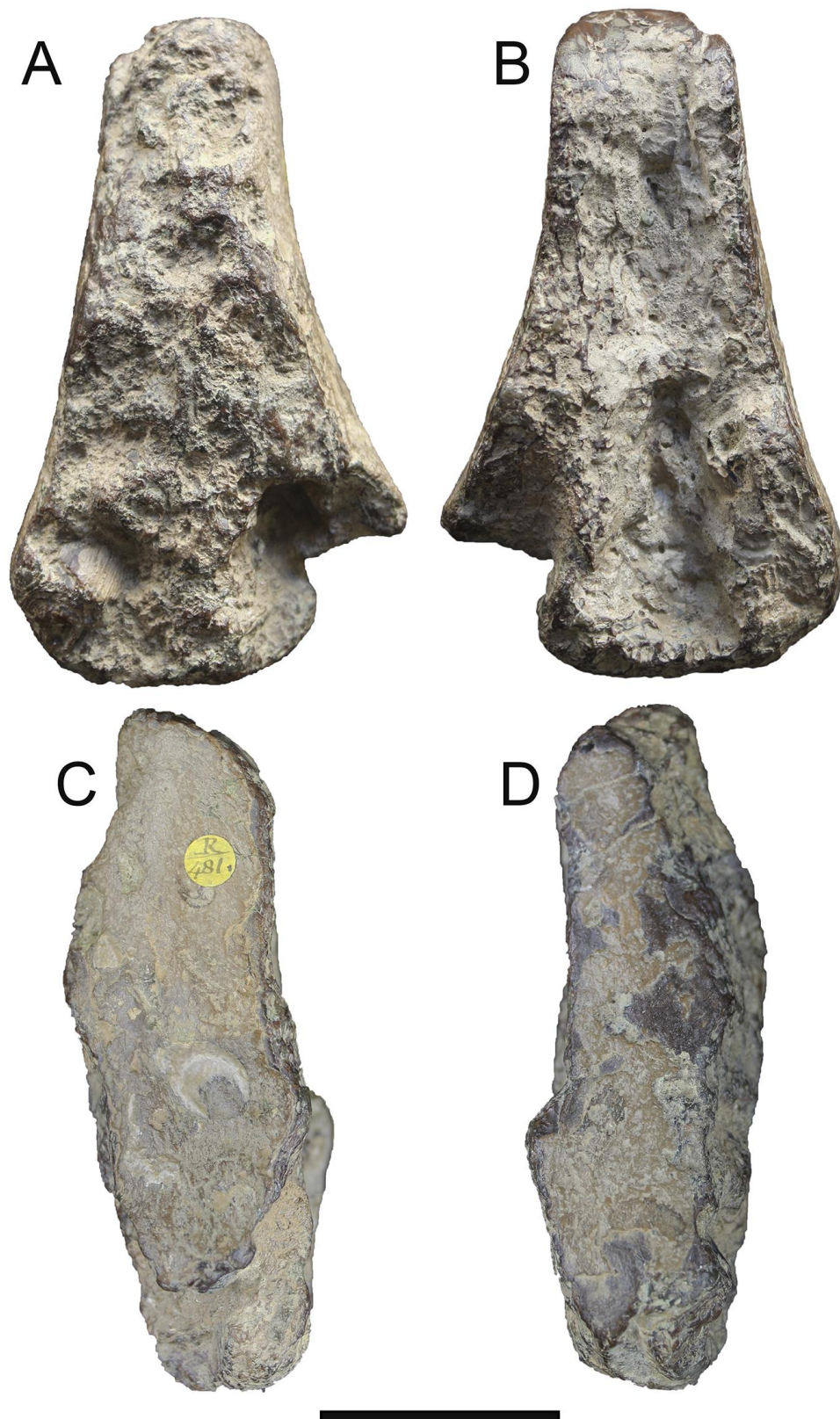


Figure S2. *Nicorhynchus* cf. *capito* gen. et. comb. nov., NHMUK R481. **A.** anterior view. **B.** posterior view. **C.** left lateral view. **D.** right lateral view. Scale bar 50 mm. Photos by BH.



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.

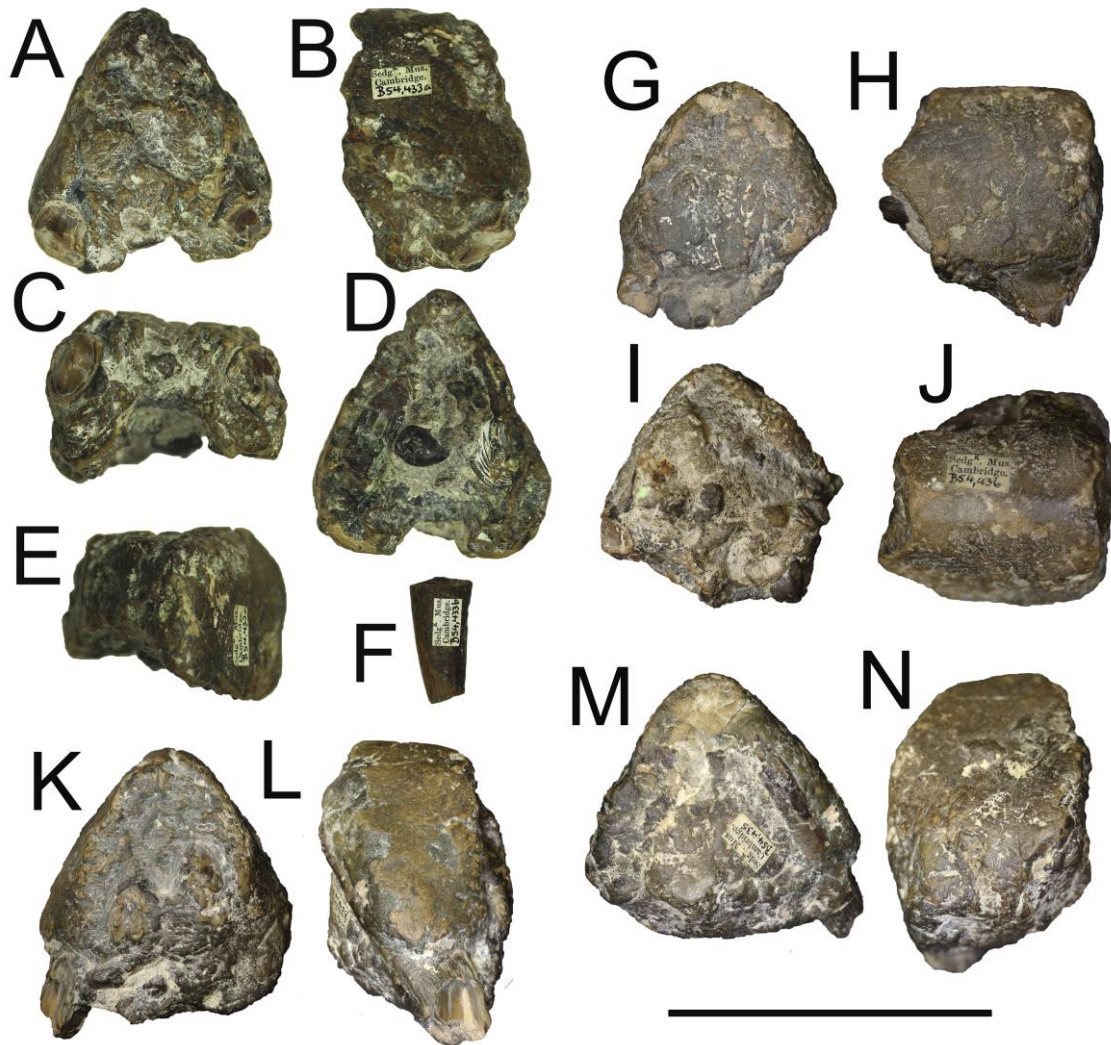


Figure S4. Coloborhynchinae indet. from the Cambridge Greensand, originally considered as *Pterodactylus woodwardi*. **A–F** CAMSM B54433, originally identified as the holotype of *Pterodactylus woodwardi*. **A.** anterior view. **B.** left lateral view. **C.** palatal view. **D.** posterior view. **E.** 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>

Camposipterus_nasutus 1?????????????????01???01000--0??0-----
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Anhanguera_piscator 1010102000011?1????000101000010100010200000000100-
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Caulkicephalus_trimicrodon
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Ferrodraco_lentoni
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Mythunga_camara
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Tropeognathus_mesembrinus 1010002000011010011000?01000010000010200000100000-
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Siroccoptyryx_moroccensis

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Aerodraco_sedgwickii_comb._nov.

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Coloborhynchus_clavirostris

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Uktenadactylus_wadleighi

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Uktenadactylus_rodriguesae_sp._nov.

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Nicorhynchus_capito_comb._nov.

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Nicorhynchus_fluviferox_comb._nov.

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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 Foramina_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_width;

{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_height 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;

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{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);
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