**Supplemental File**

Characters added to the list of 853 phenotypic characters of Brusatte et al. (2014).

**Character 854:** **Length of the skull (Novas et al., 2009)**

0: less than the length of the femur

1: the same or 25% greater than the length of the femur

2: more than 25% the length of the femur

Modified: a new state 1 was added because some taxa, e.g., *Yanornis martini*, have a skull longer than the femur but less than 25% of the length of this bone.

**Character 855: Postantral wall of the maxilla posteriorly extended (Novas et al., 2009)**

0: absent

1: present

**Character 856:** **Striations on the crowns of the teeth (Gianechini et al., 2011)**

0: absent

1: present

Striations on the crowns are considered as two or more longitudinal furrows on the labial and/or lingual surface. Isolated furrows, as those observed in *Sinornithosaurus millenii*, are not considered as striations.

Characters from Hu et al. (2009)

**Character 857:** **Dorsal centra**

0: ≥ 1.2×taller than long

1: height ≤ length

**Character 858: Length of manual digit II (including metacarpal)**

0: less than 1.25×femoral length

1: ≥ 1.25×femoral length

**Character 859: Manual phalanx I-1 (Pérez-Moreno et al., 1994)**

0: longer than metacarpal II

1: shorter than metacarpal II

**Character 860: Strong kink of pubis at midshaft**

0: absent

1: present, displacing distal half of pubis caudally

**Character 861:** **In adult, femur length**

0: longer than tibia

1: shorter than tibia

**Character 862:** **Metatarsus length**

0: less than half length of femur

1: more than half femoral length

**Character 863: Length of pedal phalanx II-2**

0: between 0.6×and 1× length of phalanx II-1

1: ≤0.6 × length of phalanx II-1

2: ≥1× length of phalanx II-1

**Character 864:** **Manual phalanx II-1**

0: shorter than I-1

1: longer than I-1

**Character 865:** **Pneumatopores in anterior caudal vertebrae**

0: absent

1: present

**Character 866:** **Length of manual phalanx III-2**

0: subequal to length of phalanx III-1

1: significantly shorter than phalanx III-1

2: significantly longer than phalanx III-1

**Character 867:** **Location of the anteroventral process of ilium**

0: anteriorly located, close to the anterior end of the bone

1: posteriorly located, significantly away from the anterior end

**Character 868: Location of the postorbital process of the jugal**

0: locatedsignificantly anterior to the posterior end of the jugal

1: close to the posterior end, and consequently the quadratojugal process is very short

Characters from Gianechini et al. (2017)

**Character 869:** **Inclination of the ventral process of the lacrimal**

0: ventrally directed so the process is vertical

1: anteroventrally inclined

**Character 870:** **Inclination of the dorsal portion of the ilium above or slightly posterior to the acetabulum**

0: in the same plane than the remain of the iliac blade

1: strongly laterally curved, so the lateral surface of the iliac blade can be observed in ventral view

**Character 871:** **Extension of the supracetabular crest of the ilium**

0: extended only along the dorsal border of the acetabulum

1: anteriorly extended along the lateral surface of the pubic peduncle, reaching or almost reaching the ventral end of the peduncle

**Character 872:** **Angle between the posterior border of the pubic shaft and the dorsal border of the pubic boot**

0: less than 90°

1: greater than 90°

**Character 873:** **Dorsal surface of the acetabulum**

0: perpendicular with the lateral surface of the iliac blade, so the acetabulum is totally open

1: dorsal surface of the acetabulum ventrally and medially inclined, so the acetabulum tends to be obliterated

**Character 874:** **Anteroposterior extension of the pubic peduncle**

0: less than the anteroposterior extension of the acetabulum

1: between 1 and 1.5 the anteroposterior extension of the acetabulum

2: > 1.5 the anteroposterior extension of the acetabulum

**Character 875: Foramen in the ventral part of the splenial (mylohyoid foramen) (character from Rauhut, 2003)**

0: absent

1: completely enclosed in the splenial

2: opened anteroventrally

**Character 876: Middle of maxillary tooth row, spacing between teeth**

0: narrow, teeth separated by less than one crown width

1: wide, adjacent teeth separated by a gap corresponding to one crown width or more.

New characters

**Character 877: Pennaceous feathers on the body**

0: absent

1: present

**Character 878: Elongated pennaceous feathers on forelimbs**

0: absent

1: present and symmetric

2: present and asymmetric

**Character 879: Alula**

0: absent

1: present

**Character 880: Elongated pennaceous feathers on the tibia**

0: absent

1: present

**Character 881**: **Elongated pennaceous feathers on the foot (Metatarsus and/or and pedal phalanges)**

0: absent

1: present

**Character 882: Elongated pennaceous feathers on the tail**

0: absent

1: present

**Character 883: A pair of extremely elongated pennaceous feathers (e.g. PRPFs)**

0: absent

1: present

**Character 884: Egg geometry**

0: symmetric

1: asymmetric

2: asymmetric with modern avian outline

**Supplemental references**

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