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SUPPLEMENTARY ONLINE MATERIAL FOR

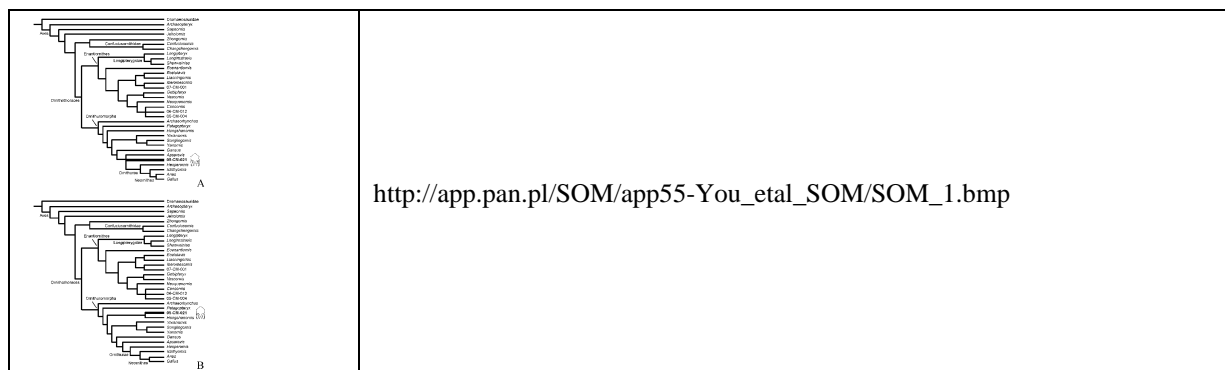
A second Cretaceous ornithuromorph bird from the Changma Basin, Gansu Province, northwestern China

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SOM_1

Hypothesized phylogenetic position of *Ornithuromorpha* gen. et sp. indet. (FRDC-05-CM-021 [05-CM-021, indicated by sternum]) from the Early Cretaceous of the Changma Basin, northwestern Gansu Province, China. Two most parsimonious trees (A, B) of 592 steps (CI = 47; RCI = 47; RI = 67) recovered by cladistic analysis. Other specimen numbers correspond to undescribed enantiornithine fossils in the FRDC collection.



SOM_2

Apomorphies supporting nodes (with absolute/relative [0-100] Bremer support values in parentheses) from one of the two most parsimonious trees recovered by the present phylogenetic analysis (depicted in SOM_1:A).

Confuciusornithidae (3/45):

- char 62: 0 --> 2
- char 128: 1 --> 2
- char 172: 0 --> 1
- char 173: 0 --> 1
- char 231: 0 --> 2

Zhongornis + *Confuciusornithidae* (1/4):

char 35: 0 --> 1
 char 103: 1 --> 0
 char 143: 1 --> 0
 char 175: 1 --> 0

Shanweinia + *Longirostravis* (2/8):

char 171: 0 --> 1
 char 209: 0 --> 1

Longipterygidae (2/38):

char 5: 0 --> 1
 char 79: 0 --> 1
 char 196: 0 --> 1

Eoalulavis + *Liaoningornis* (1/8):

char 117: 2 --> 3

Gobipteryx + *Vescornis* (1/8):

char 77: 1 --> 0
 char 238: 0 --> 1

Iberomesornis + FRDC-07-CM-001 (1/4):

char 220: 1 --> 0

(Eoalulavis + Liaoningornis) + (Iberomesornis + FRDC-07-CM-001) (1/4):

char 52: 1 --> 0
 char 81: 0 --> 1

Songlingornis + *Yanornis* (3/38):

char 62: 1 --> 2
 char 109: 1 --> 0
 char 111: 1 --> 2

(Songlingornis + Yanornis) + Yixianornis (hereafter “*Songlingornis* clade”) (2/10):

char 4: 2 --> 1
 char 110: 2 --> 1
 char 117: 1 --> 4
 char 118: 0 --> 1
 char 156: 0 --> 1

Neornithes (2/50):

char 8: 0 --> 1
 char 29: 1 --> 2
 char 33: 0 --> 1
 char 35: 0 --> 1
 char 51: 1 --> 0
 char 62: 2 --> 0
 char 65: 4 --> 6
 char 68: 1 --> 2
 char 92: 1 --> 2

char 110: 0 --> 1
 char 113: 1 --> 0
 char 126: 0 --> 1
 char 127: 0 --> 1
 char 128: 1 --> 0
 char 130: 1 --> 0
 char 135: 0 --> 1
 char 147: 2 --> 1
 char 157: 0 --> 1
 char 158: 1 --> 3
 char 178: 0 --> 1
 char 180: 0 --> 1
 char 213: 1 --> 2
 char 214: 1 --> 0

Ichthyornis + Neornithes (1/4):

char 48: 0 --> 1
 char 68: 0 --> 1
 char 119: 0 --> 1
 char 192: 0 --> 1

Ornithurae (1/8):

char 110: 2 --> 0

Apsaravis + FRDC-05-CM-021 + Ornithurae (0/0):

char 62: 1 --> 2
 char 151: 0 --> 1
 char 162: 0 --> 1
 char 189: 0 --> 1
 char 191: 0 --> 1
 char 197: 0 --> 1
 char 198: 1 --> 2

Gansus + (*Apsaravis* + FRDC-05-CM-021 + Ornithurae) (0/0):

char 65: 3 --> 4
 char 81: 0 --> 1
 char 167: 1 --> 2

“*Songlingornis* clade” + (*Gansus* + (*Apsaravis* + FRDC-05-CM-021 + Ornithurae)) (0/0):

char 95: 0 --> 1
 char 224: 0 --> 1

Hongshanornis + (“*Songlingornis* clade” + (*Gansus* + (*Apsaravis* + FRDC-05-CM-021 + Ornithurae))) (1/4):

char 62: 0 --> 1
 char 121: 0 --> 1
 char 189: 1 --> 0

Patagopteryx + (*Hongshanornis* + (“*Songlingornis* clade” + (*Gansus* + (*Apsaravis* + FRDC-05-CM-021 + Ornithurae)))) (1/4):

char 65: 2 --> 3
 char 73: 1 --> 2
 char 187: 1 --> 0
 char 199: 0 --> 1
 char 209: 0 --> 1
 char 225: 0 --> 1

Ornithuromorpha (1/8):

char 65: 1 --> 2
 char 96: 0 --> 1
 char 192: 1 --> 0
 char 221: 0 --> 1

Concornis + FRDC-06-CM-012 + FRDC-05-CM-004 (1/4):

char 236: 1 --> 0

((*Concornis* + FRDC-06-CM-012 + FRDC-05-CM-004) + *Neuquenornis* (1/4):

char 229: 0 --> 1

((*Gobipteryx* + *Vescornis*) + ((*Concornis* + FRDC-06-CM-012 + FRDC-05-CM-004) + *Neuquenornis*) (1/4):

char 62: 0 --> 1
 char 128: 0 --> 1
 char 167: 1 --> 2

((*Eoalulavis* + *Liaoningornis*) + (*Iberomesornis* + FRDC-07-CM-001)) + ((*Gobipteryx* + *Vescornis*) + (*Concornis* + FRDC-06-CM-012 + FRDC-05-CM-004) + *Neuquenornis*) (1/4):

char 80: 1 --> 0
 char 237: 0 --> 1

Eoenantiornis + (((*Eoalulavis* + *Liaoningornis*) + (*Iberomesornis* + FRDC-07-CM-001)) + ((*Gobipteryx* + *Vescornis*) + (*Concornis* + FRDC-06-CM-012 + FRDC-05-CM-004) + *Neuquenornis*))) (1/8):

char 65: 1 --> 0
 char 90: 0 --> 1
 char 91: 0 --> 1
 char 93: 0 --> 1
 char 150: 0 --> 1
 char 176: 3 --> 2
 char 226: 0 --> 1
 char 236: 0 --> 1

Enantiornithes (1/8):

char 44: 0 --> 1
 char 77: 0 --> 1
 char 88: 0 --> 1
 char 106: 0 --> 1
 char 107: 0 --> 2
 char 117: 1 --> 2
 char 122: 0 --> 1

char 128: 1 --> 0
 char 138: 0 --> 1
 char 166: 0 --> 1

Ornithothoraces (2/29):

char 19: 0 --> 1
 char 51: 0 --> 1
 char 57: 0 --> 1
 char 73: 0 --> 1
 char 84: 0 --> 1
 char 105: 0 --> 1
 char 113: 0 --> 1
 char 125: 0 --> 1
 char 149: 0 --> 1
 char 153: 2 --> 3
 char 167: 0 --> 1
 char 170: 0 --> 1
 char 174: 0 --> 1
 char 175: 1 --> 2
 char 223: 0 --> 1
 char 241: 0 --> 1

Ornithothoraces + (*Zhongornis* + Confuciusornithidae) (1/4):

char 52: 0 --> 1
 char 139: 0 --> 1
 char 147: 0 --> 2
 char 148: 0 --> 1
 char 207: 0 --> 1

Jeholornis + (Ornithothoraces + (*Zhongornis* + Confuciusornithidae)) (1/4):

char 3: 1 --> 2
 char 4: 0 --> 2
 char 6: 0 --> 1
 char 8: 0 --> 1
 char 59: 0 --> 1
 char 82: 0 --> 1
 char 92: 0 --> 1

Sapeornis + (*Jeholornis* + (Ornithothoraces + (*Zhongornis* + Confuciusornithidae))) (5/67):

char 1: 0 --> 1
 char 3: 0 --> 1
 char 7: 0 --> 1
 char 20: 0 --> 1
 char 23: 0 --> 1
 char 65: 0 --> 1
 char 85: 0 --> 1
 char 103: 0 --> 1
 char 127: 1 --> 0
 char 143: 0 --> 1
 char 144: 0 --> 1
 char 153: 0 --> 2

char 154: 0 --> 1
char 175: 0 --> 1
char 190: 0 --> 1
char 198: 0 --> 1
char 205: 0 --> 1
char 219: 0 --> 1
char 220: 0 --> 1
char 239: 0 --> 1

Aves:

char 54: 0 --> 1
char 71: 0 --> 2
char 95: 1 --> 0
char 128: 0 --> 1
char 187: 0 --> 1
char 192: 0 --> 1
char 240: 0 --> 1

SOM_3

States of 242 morphological characters in avian taxa and specimens included in the phylogenetic analysis presented here but not in that published by O'Connor et al. (2009). See O'Connor et al. (2009: appendices 2, 3) for character list and states for remaining taxa included in the present analysis. (Character list and matrix from O'Connor et al. [2009] are also freely available at <http://dinosaurs.nhm.org/research/avian.htm>.)

FRDC-07-CM-001

????????? ?????????? ?????????? ?????????? ?????????? ??????????
????[1234]????[12] 4?00?0???? ?????????? ?????????? ?????????? ??????????
?????????? ?????????? ?????????? ?????????? ?????????? ?????????? ??????????
??[12]?????? ?1??0??0? ?[01]??????10 0?10010010 1??0111011 ?0

FRDC-06-CM-012

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????????11?? ??????????? ??????????? ??????????? ??????????? ???????????
?????????? ??????????? ??????????? ??????????? ?????1??1?? ?????110?[12]?? ?1??0??1?
??0?0??11 00?0010??0 12?020?011 ??

FRDC-05-CM-004

?????????? ??????????? ??????????? ??????????? ??????????? ??????????01? ?[01]10?0??2
4??10?1?? 0????????? ?????????? ?????????? ?????????? ?????????? ??????????
?????????? ??????????? ??????????? ??????????0?? ??????????1 0111??0[12]?? ?1??0???
?[01]??????11 0??001??1? 11?020?011 ?0

Archaeorhynchus

10120111[12]? ?????????? ?????????? ?????1?00?? ?0?00??1?? ?0?????0??
1??2000?? [34]0111????? 01111?0010 ?20?010000 ?0?2100[23]1[12] ?1???????
?000??010? ???0??011 0?10????10 1?010?00?? ?0??0?2101 0??230000 ??????1011
00?[12]10010? ?????????? ?00????211 1010000?? [01]0?0[01]0?0?? ??

Liaoningornis

????????? ?????????? ?????????? ?????????? ?????????? ?????????? ??????????
???????????? ????????????? ????????????? ??????????20 ??1[12]??30?? ?????????? ?????????0??
??1????????? ?????????????? ?????????????? ?????????????? ?????????????? ??????????????
??????????1 10?001????? 1[12]?010?01[12] ??

Songlingornis

??[01]?????? ????????????? ????????????? ?????000?? ?0?????1? ??????????? ?2?????????
???????????? ?11?????10 1??1????? ??21?0301 2111??41?? ??????????? ???????????
???????????? ?????????????? ?????????????? ?????????????? ?????????????? ??????????????
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FRDC-05-CM-021

????????????? ?????????????? ?????????????? ?????????????? ?????????????? ??????????????
????????????? ?????????????? ?????????????? ??2100[23]?2 21111[123]10?? ???????????
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