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SUPPLEMENTARY ONLINE MATERIAL FOR

A new Early Devonian antiarch (Placodermi) from Belarus, and phylogeny of Asterolepidoidei

Dmitry P. Plax and Ervins Lukševičs

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Supplementary Online Material

SOM 1. Phylogenetic Analysis of Antiarchi (modified from Wang & Zhu 2018)

1) Character list
2) Data matrix with 80 morphological characters for 47 taxa

SOM 2. Phylogenetic Analysis of Euantiarchi (modified from Wang & Zhu 2018)

1) Character list
2) Data matrix with 57 morphological characters for **33 taxa of Euantiarcha**

SOM 1. Phylogenetic Analysis of Antiarchi (modified from Wang & Zhu 2018)

1) Character list

Ornamentation, histology and scales

1. **Adult ornamentation**:
   tubercular (0);
   reticular (1).
   Wang & Zhu (2018, Character 1).

2. **Adult ornamentation:**
   non-ridged (0);
   ridged (1).
   Wang & Zhu (2018, Character 2).

3. **Ridges on dorsal wall of trunk shield:**
   converging (0);
   subparallel (1).
   Wang & Zhu (2018, Character 3).

4. **Dorsal spongy layer in dermal bone of trunk shield:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 4).

5. **Ridged scales:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 5).

Head shield and neurocranium

6. **Premedian plate:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 6).

7. **Premedian plate:**
   short and broad (0);
   long and narrow (1).
   Wang & Zhu (2018, Character 7).

8. **Anterior margin of premedian plate:**
   convex (0);
   slightly concave (1).
   Wang & Zhu (2018, Character 8).

9. **Unornamented shelf and rostrocaudal groove on premedian plate:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 9).

10. **Rostral width/orbital width index of premedian plate:**

smaller than 200 (0).
larger than 200 (1).
Wang & Zhu (2018, Character 10).

11. Lateral plate:
absent (0);
present (1).
Wang & Zhu (2018, Character 11).

12. Lateral plate:
narrow (0);
broad (1).
Wang & Zhu (2018, Character 12).

13. Preorbital depression:
present (0);
absent (1).
Wang & Zhu (2018, Character 13).

14. Preorbital depression:
extending laterally onto lateral plates (0);
restricted to premedian plate (1).
Wang & Zhu (2018, Character 14).

15. Preorbital recess:
absent (0);
present (1);
Wang & Zhu (2018, Character 15).

16. Preorbital recess:
restricted to premedian plate (0);
extending laterally to the lateral plates (1).
Wang & Zhu (2018, Character 16).

17. Orbital opening:
open (0);
enclosed by skull roof plates (1).
Wang & Zhu (2018, Character 17).

18. Orbital fenestra:
large (0);
small (1).
Wang & Zhu (2018, Character 18).

19. Relative position of orbital fenestra (ordered):
anterior (0);
slightly anterior (1);
slightly posterior (2);
posterior (3).
Wang & Zhu (2018, Character 19).

20. Nasal opening:
at anterolateral corners of rostral plate (0);
at anterior margin of rostral plate (1).
Wang & Zhu (2018, Character 20).

21. Postpineal and nuchal plates:
long and narrow (0);
short and broad (1).
Wang & Zhu (2018, Character 21).

22. Pronounced postpineal thickening:
absent (0);
present (1).
Wang & Zhu (2018, Character 22).

23. Position of postorbital crista:
extending medially to postpineal plate (0);
extending obliquely to nuchal plate (1).
Wang & Zhu (2018, Character 23).

24. Nuchal plate:
without orbital facets (0).
with orbital facets (1).
Wang & Zhu (2018, Character 24).

25. Supraotic thickening of head shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 25).

26. Median occipital crista of head shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 26).

27. Posterior process of head shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 27).

28. Obstantic margin:
long (0);
short (1).
Wang & Zhu (2018, Character 28).

29. Central sensory canal:
present (0);
absent (1).
Wang & Zhu (2018, Character 29).

30. Supraorbital canal:

present (0);
absent (1).
Wang & Zhu (2018, Character 30).

31. X-shaped pit-line grooves:
present (0);
absent (1).
Wang & Zhu (2018, Character 31).

32. Branch of infraorbital canal diverging on lateral plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 32).

33. Semicircular pit-line:
absent (0);
present (1).
Wang & Zhu (2018, Character 33).

34. Occipital cross-commissure issued from infraorbital canal:
absent or short (0);
long and extending onto nuchal plate (1).
Wang & Zhu (2018, Character 34).

35. Anterior postorbital process:
behind anterior level of orbital notch (0);
extending in front of orbital notch (1).
Wang & Zhu (2018, Character 35).

36. Anterior postorbital process:
at or behind posterior level of orbital notch (0);
in front of posterior level of orbital notch (1).
Wang & Zhu (2018, Character 36).

37. Cavity for cranio-spinal process:
absent (0);
present (1).
Wang & Zhu (2018, Character 37).

38. Supraoccipital pit of head shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 38).

39. Confluence between anterior and posterior semicircular canals:
midway between orbital notch and transverse nuchal crista or close to orbital notch (0);
close to transverse nuchal crista (1).
Wang & Zhu (2018, Character 39).

40. Endolymphatic duct through head shield:
long tube (0);

short tube (1).
Wang & Zhu (2018, Character 40).

41. Occipital portion of endocranium
long (0);
short (1).
Wang & Zhu (2018, Character 41).

42. Submarginal articulation:
absent (0);
present (1).
Wang & Zhu (2018, Character 42).

43. Postsuborbital plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 43).
The plate was termed as the prelateral plate in Zhu (1996).

44. Postsuborbital plate:
with a long anterior process (0);
equilateral, triangular in shape (1).
Wang & Zhu (2018, Character 44).

45. Postsuborbital plate:
behind suborbital plate (0):
above suborbital plate (1).
Wang & Zhu (2018, Character 45).
The suborbital was termed as the mental plate in Zhu (1996).

46. Suborbital plates of both sides:
separated (0):
meeting in the midline (1).
Wang & Zhu (2018, Character 46).

Trunk shield

47. Shape of trunk shield:
low and elongated (0);
high and short (1).
Wang & Zhu (2018, Character 47);

48. Number of median dorsal plates:
one (0);
two (1).
Wang & Zhu (2018, Character 48).

49. Index (r_1) between width of anterior margin and maximum width of anterior median dorsal plate (ordered):
r1>55 (0);
35=<r1=<55 (1);
15=<r1<35 (2);

<15 (3).
Wang & Zhu (2018, Character 49).

The anterior median dorsal plate of antiarchs is homologous to the median dorsal plate 1 in *Qilinyu* (Zhu et al. 2016) and the extrascapular plate in *Entelognathus* (Zhu et al. 2013), and some arthrodires (Goujet 1973). It is absent in *Kujdanowiaspis*.

50. Index (r_2) between anterior and posterior divisions of anterior median dorsal plate (ordered):
r_2<300 (0);
300=<r_2=<500 (1);
>500 (2).
Wang & Zhu (2018, Character 50).

51. Tergal angle of anterior median dorsal plate:
centrally or posteriorly placed (0);
anteriorly placed (1).
Wang & Zhu (2018, Character 51).

52. Dorsal spine of anterior median dorsal plate:
absent (0);
present (1).
Wang & Zhu (2018, Character 52).

53. Anterior median dorsal plate:
completely overlapping anterior dorsolateral plate (0);
partly overlapping anterior dorsolateral plate (1).
Wang & Zhu (2018, Character 53).

54. Anterior median dorsal plate:
underlapping or partly overlapping posterior dorsolateral (or mixilateral) plate (0);
completely overlapping posterior dorsolateral (or mixilateral) plate (1).
Wang & Zhu (2018, Character 54).

55. Anterior median dorsal plate:
partly or completely overlapping posterior dorsolateral (or mixilateral) plate (0);
underlapping posterior dorsolateral (or mixilateral) plate (1).
Wang & Zhu (2018, Character 55).

56. Anterior ventral process and pit on anterior median dorsal plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 56).

57. Lateral process of posterior median dorsal plate:
conspicuous (0);
reduced (1).
Wang & Zhu (2018, Character 57).

58. Crista transversalis interna posterior of trunk shield:
lying laterally to posterior ventral pit and process of posterior median dorsal plate (0).
lying behind posterior ventral pit and process of posterior median dorsal plate (1).

Wang & Zhu (2018, Character 58).

59. Posterior ventral pit and process of posterior median dorsal plate:
on crista transversalis interna posterior (0);
posteriorly migrated behind crista transversalis interna posterior (1).
Wang & Zhu (2018, Character 59).

60. *Crista transversalis interna posterior* of trunk shield:
lying laterally to posterior ventral process and pit (0).
turning anteriorly and in front of posterior ventral process and pit (1).
Wang & Zhu (2018, Character 60).

61. Anterior lateral plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 61).

62. Chang's apparatus:
absent (0);
present (1).
Wang & Zhu (2018, Character 62).

63. Ventrolateral fossa of trunk shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 63).

64. Posterior dorsolateral and posterior lateral plates:
independent (0);
fused to form a mixilateral plate (1).
Wang & Zhu (2018, Character 64).

65. Posterior ventrolateral and posterior lateral plates:
independent (0);
fused to form (or replaced by) a single plate (1).
Wang & Zhu (2018, Character 65).

66. Semilunar plate:
paired (0);
unpaired (1).
Wang & Zhu (2018, Character 66).

67. Large rectangular aperture on ventral wall of trunk shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 67).

68. Spinal plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 68).

69. Postbranchial lamina:
external and upright (0);
internal and horizontal (1).
Wang & Zhu (2018, Character 69).

70. Pectoral fin:
scale-covered (0);
modified into a slender appendage covered with small dermal plates (1).
Wang & Zhu (2018, Character 70).

71. Number of plates encircling pectoral fenestra:
two or more (0);
one (1).
Wang & Zhu (2018, Character 71).

72. Brachial process:
absent (0);
present (1);
Wang & Zhu (2018, Character 72).

73. Brachial process:
simple (0);
helmet-shaped (1);
Wang & Zhu (2018, Character 73).

74. Axillary foramen:
small (0);
large (1).
Wang & Zhu (2018, Character 74).

75. Pectoral appendage:
unjointed (0);
jointed (1).
Wang & Zhu (2018, Character 75).

76. Dorsal central plate 1 and dorsal central plate 2 of pectoral appendage:
in contact (0);
separated (1).
Wang & Zhu (2018, Character 76).

77. Pectoral appendage:
short (0);
elongated (1).
Wang & Zhu (2018, Character 77).

78. Lateral marginal plate 2 relative to trunk shield:
short (0);
elongated (1).
Wang & Zhu (2018, Character 78).

79. Number of lateral marginal plates of distal segment:

three (0);

two (1).

Wang & Zhu (2018, Character 79).

80. PDL overlaps ADL in dorsal part and is overlapped in ventral part:

absent (0);

present (1).

New character, based on character mentioned by Young (2010).

2) Data matrix with 80 morphological characters for 47 taxa

? = unavailable character; - = logical impossibility. Data are interleaved to facilitate copying and pasting into NEXUS format.

Kujdanowiaspis 00-000----0-?-??000???-000100000000000000-010000--------
?00000000000000---------

Romundina 00-00100000-0-0-000000-000110000000000000-??0011?-------?00000000-
10000---------

Chuchinolepis 00-0?1000011000-
110?00?000001000000??1???0????0130100000000001??000011110-00000-0

Vanchienolepis 00-
0??0130100001 0???1??000111110-1????-0

Zhanjilepis 00-
0?????????????????0?????????????????????????0130000000000 01?100?0???????????-0

Heteroyunnanolepis 00-
0010000111??0110?00?0?000?00??0???????0????0130000000000 01??000011110-0????-0

Yunnanolepis 00-0?1000011000-
110?000000001000000011000 0????0130000000000111110000?1110-00000-0

Mizia 00-0?1000011000-
110000?0??00110000000?????0000?0130000000000111100001 1110-00000-0

Phymolepis 00-0??0???11???-
11??000000000110?000011000?????0130000000000111100001 1110-00000-0

Parayunnanolepis 00-001000011000-
100?00?0??00110?000??????0????0130000000000111?000011110-00000-0

Minicrania 00-
0?10000100010100?00?0??0010110100?10??0????0100100000000 01??000011110-0?????0

Liujiangolepis 00-
0010001110 0??112?10?0???0111100 00?????0????0100100100 00?0100010111111 00101000

Xichonolepis 00-
0?100011101??111000?0???0111100???????0????0121100100001 0100010111111 0010?000

Dayaoshania 00-
0?100011101??110?10?0???0111100???????0????0121100100 00??1000101111110 0100000

Grenfellaspis 00-
0?1000111011 0110?00?000001111 00???1?110????0112100100101 0100010111111 0010?00
0

Sinolepis 00-
0?100011001??110?00?0?000111100 00?????0????0102100100 10??1000101111110 0010?000

Wudinolepis
0100?1100011 00??103?00?????00111010 1?01???????0100100010010010001101111111?0
1?0

Hohsienolepis 0110?1100011000??103000?0???001110?????????????0100100010010010001101111111?1?0??0
Microbrachius 0110?1100011000-103?000001100111010100111?????0100100010010010001101111111100?0
Bothriolepis 10-0011000111-1111201011111001001011011111011001001000100100100011011111111111110
Grossilepis 00-0?11000111-11112?10?1?1100100101100???1011?0100100100010010010001101111111111110
Wufengshania 00-0010000111-11102?10111?1101000001001111?????????????????????????????1111??????0
Briagalepis 00-0????????????1??????????????00????????1????0100101010010010001101111112?????0
Monarolepis 00-0????????????1???????111?0?1??????0111?????0100101010010010001101111110111?1?0
Vietnamaspis 00-00???????1-??1?????????????????????????????0110100010110012?0???011111111???10
Dianolepis 00-0?11000111-11102?10?0???00101000?1?1?1????0110100010010010001101111110101??0
Tenizolepis 00-0?11000111-1110201??0???011?10?????????????0100101010010010001101111111?1??1?0
Luquanolepis 00-0????????????1??????????????????????????????0110100??00100100001011111101?01?0
Nawagiaspis 00-0?11000101-??103?10??????11??0001?????100101110102??00100100001011111101????0
Jiangxilepis 10-0?11000101-11102?1000?0?0111100010011?????0110010011010010010101111111011?0
Ningxialepis 10-001????1?????1??????0???00?0??1???????0????111001101?0110100102?01?1111?1011?0
Kirgisolepis 00-0?11000101-10102?1??0???1010011????????1???111001101?0100100102?011111111????0
Hunanolepis 00-0?11000101-10103010?011?1111101010011101???111000001101001001000111111010011 0
Wurungulepis 00-01???????????1??????????????????????????????11?000001?0100100000011111102?????0
Sherbonaspis 00-0?10100101-1010??10?0??11111??101?????01???112000001101001001000111111010000 0
Stegolepis 0?-0?11100101-10101?1??0???1111101????????1???112001000101001000000111111010000?0
Asperaspis 00-0??013100000102??1000010111111?????00
Byssacanthus 00-0?11000101-10102?00?0???1111111???????01???111001000101001000000111111010001 0
Pterichthyodes 00-0111000101-10102?10101111110101010011101??111100000110100100100011111101000 00
Grossaspis 00-1????????????1??????????????????????????????111000001101001002?0?01111110?????0
Lepadolepis 00-1????????????1??????????????????????????????111000001101001002?0?01111110100 0?0
Gerdalepis 00-1?10000101-1010000??0???1111101????????1???111000001101001001010111111010000 0

Walterilepis 00-0?1????101-
10101?1??0???10????1????????1???11??0000110100100?0?01111110100?0
Pambulaspis 00-0?10110101-
1010111100111111110101001111?1???013000001101001000000111111?000?1
Merimbulaspis 00-0?10110101-
1010111?00???1????????0?????????013???101?01001000?01111110??00?11
Asterolepis 00-0110110101-
1010111000101111110101001110 1??1013000010101001001000111111010001 0
Remigolepis 00-0?10110101-
1010111100101111110101?011101??1013000000101001000000?1111100000-0

SOM 2. Phylogenetic Analysis of Euantiarchi (modified from Wang & Zhu 2018)

1) Character list

Ornamentation, histology and scales

1. **Adult ornamentation**:
   tubercular (0);
   reticular (1).
   Wang & Zhu (2018, Character 1).

2. **Adult ornamentation:**
   non-ridged (0);
   ridged (1).
   Wang & Zhu (2018, Character 2).

3. **Ridges on dorsal wall of trunk shield:**
   converging (0);
   subparallel (1).
   Wang & Zhu (2018, Character 3).

4. **Dorsal spongy layer in dermal bone of trunk shield:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 4).

5. **Ridged scales:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 5).

Head shield and neurocranium

6. **Premedian plate:**
   short and broad (0);
   long and narrow (1).
   Wang & Zhu (2018, Character 7).

7. **Anterior margin of premedian plate:**
   convex (0);
   slightly concave (1).
   Wang & Zhu (2018, Character 8).

8. **Unornamented shelf and rostrocaudal groove on premedian plate:**
   absent (0);
   present (1).
   Wang & Zhu (2018, Character 9).

9. **Rostral width/orbital width index of premedian plate:**
   smaller than 200 (0).
   larger than 200 (1).
   Wang & Zhu (2018, Character 10).

10. **Lateral plate:**
    narrow (0);
    broad (1).
    Wang & Zhu (2018, Character 12).

11. **Preorbital depression:**
    present (0);
    absent (1).
    Wang & Zhu (2018, Character 13).

12. **Preorbital recess:**
    absent (0);
    present (1);
    Wang & Zhu (2018, Character 15).

13. **Preorbital recess:**
    restricted to premedian plate (0);
    extending laterally to the lateral plates (1).
    Wang & Zhu (2018, Character 16).

14. **Orbital fenestra:**
    large (0);
    small (1).
    Wang & Zhu (2018, Character 18).

15. **Relative position of orbital fenestra (ordered):**
    anterior (0);
    slightly anterior (1);
    slightly posterior (2);
    posterior (3).
    Wang & Zhu (2018, Character 19).

16. **Nasal opening:**
    at anterolateral corners of rostral plate (0);
    at anterior margin of rostral plate (1).
    Wang & Zhu (2018, Character 20).

17. **Postpineal and nuchal plates:**
    long and narrow (0);
    short and broad (1).

Wang & Zhu (2018, Character 21).

18. Pronounced postpineal thickening:
absent (0);
present (1).
Wang & Zhu (2018, Character 22).

19. Position of postorbital crista:
extending medially to postpineal plate (0);
extending obliquely to nuchal plate (1).
Wang & Zhu (2018, Character 23).

20. Nuchal plate:
without orbital facets (0).
with orbital facets (1).
Wang & Zhu (2018, Character 24).

21. Supraotic thickening of head shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 25).

22. Median occipital crista of head shield:
absent (0);
present (1).
Wang & Zhu (2018, Character 26).

23. Obstantic margin:
long (0);
short (1).
Wang & Zhu (2018, Character 28).

24. Central sensory canal:
present (0);
absent (1).
Wang & Zhu (2018, Character 29).

25. X-shaped pit-line grooves:
present (0);
absent (1).
Wang & Zhu (2018, Character 31).

26. Branch of infraorbital canal diverging on lateral plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 32).

27. Semicircular pit-line:
absent (0);
present (1).
Wang & Zhu (2018, Character 33).

28. Anterior postorbital process:
behind anterior level of orbital notch (0);
extending in front of orbital notch (1).
Wang & Zhu (2018, Character 35).

29. Anterior postorbital process:
at or behind posterior level of orbital notch (0);
in front of posterior level of orbital notch (1).
Wang & Zhu (2018, Character 36).

30. Submarginal articulation:
absent (0);
present (1).
Wang & Zhu (2018, Character 42).

31. Postsuborbital plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 43).
The plate was termed as the prelateral plate in Zhu (1996).

32. Postsuborbital plate:
behind suborbital plate (0):
above suborbital plate (1).
Wang & Zhu (2018, Character 45).
The suborbital was termed as the mental plate in Zhu (1996).

33. Suborbital plates of both sides:
separated (0):
meeting in the midline (1).
Wang & Zhu (2018, Character 46).

Trunk shield

34. Shape of trunk shield:
low and elongated (0);
high and short (1).
Wang & Zhu (2018, Character 47);

35. Index (r_1) between width of anterior margin and maximum width of anterior median dorsal plate (ordered):
r1>55 (0);
35=<r1=<55 (1);
15=<r1<35 (2);
<15 (3).
Wang & Zhu (2018, Character 49).

36. Index (r_2) between anterior and posterior divisions of anterior median dorsal plate (ordered):
r_2<300 (0);
300=<r_2=<500 (1);

>500 (2).
Wang & Zhu (2018, Character 50).

37. Tergal angle of anterior median dorsal plate:
centrally or posteriorly placed (0);
anteriorly placed (1).
Wang & Zhu (2018, Character 51).

38. Dorsal spine of anterior median dorsal plate:
absent (0);
present (1).
Wang & Zhu (2018, Character 52).

39. Dorsal spine of anterior median dorsal and posterior median dorsal plate:
absent (0);
present (1).
New character.

40. Anterior median dorsal plate:
completely overlapping anterior dorsolateral plate (0);
partly overlapping anterior dorsolateral plate (1).
Wang & Zhu (2018, Character 53).

41. Anterior median dorsal plate:
underlapping or partly overlapping posterior dorsolateral (or mixilateral) plate (0);
completely overlapping posterior dorsolateral (or mixilateral) plate (1).
Wang & Zhu (2018, Character 54).

42. Anterior median dorsal plate:
partly or completely overlapping posterior dorsolateral (or mixilateral) plate (0);
underlapping posterior dorsolateral (or mixilateral) plate (1).
Wang & Zhu (2018, Character 55).

43. Anterior ventral process and pit on anterior median dorsal plate:
present (0);
absent (1).
Wang & Zhu (2018, Character 56).

44. Lateral process of posterior median dorsal plate:
conspicuous (0);
reduced (1).
Wang & Zhu (2018, Character 57).

45. Crista transversalis interna posterior of trunk shield:
lying laterally to posterior ventral pit and process of posterior median dorsal plate (0).
lying behind posterior ventral pit and process of posterior median dorsal plate (1).
Wang & Zhu (2018, Character 58).

46. Posterior ventral pit and process of posterior median dorsal plate:
on crista transversalis interna posterior (0);
posteriorly migrated behind crista transversalis interna posterior (1).

Wang & Zhu (2018, Character 59).

47. *Crista transversalis interna posterior* of trunk shield:
lying laterally to posterior ventral process and pit (0).
turning anteriorly and in front of posterior ventral process and pit (1).
Wang & Zhu (2018, Character 60).

48. Posterior dorsolateral and posterior lateral plates:
independent (0);
fused to form a mixilateral plate (1).
Wang & Zhu (2018, Character 64).

49. Posterior ventrolateral and posterior lateral plates:
independent (0);
fused to form (or replaced by) a single plate (1).
Wang & Zhu (2018, Character 65).

50. Semilunar plate:
paired (0);
unpaired (1).
Wang & Zhu (2018, Character 66).

51. Axillary foramen:
small (0);
large (1).
Wang & Zhu (2018, Character 74).

52. Pectoral appendage:
unjointed (0);
jointed (1).
Wang & Zhu (2018, Character 75).

53. Dorsal central plate 1 and dorsal central plate 2 of pectoral appendage:
in contact (0);
separated (1).
Wang & Zhu (2018, Character 76).

54. Pectoral appendage:
short (0);
elongated (1).
Wang & Zhu (2018, Character 77).

55. Lateral marginal plate 2 relative to trunk shield:
short (0);
elongated (1).
Wang & Zhu (2018, Character 78).

56. Number of lateral marginal plates of distal segment:
three (0);
two (1).
Wang & Zhu (2018, Character 79).

57. PDL overlaps ADL in dorsal part and is overlapped in ventral part:

absent (0);

present (1).

New character, based on character mentioned by Young (2010).

2) Data matrix with 57 morphological characters for 33 taxa of Euantiarcha

? = unavailable character; - = logical impossibility. Data are interleaved to facilitate copying and pasting into NEXUS format.

Parayunnanolepis 00-000000100-00?00?0??010?00?0???0300000000000100000000-0
Grenfellaspis 00-0?000110101O?00?0000111O??0???012100010010100100l0?000
Wudinolepis 0100?100010??03?00????0011001????000100001001000111l?01?0
Hohsienolepis 0110?100010??03000?0??00110?????000100001001000111?1?0??0
Microbrachius 0110?1000100-03?000001001100l1???000100001001000111110O?0
Bothriolepis 10-00100011111201011110000111101000010000100100011111111O
Grossilepis 00-0?100011111 2?10?1?100001111O1?000100010001000111111110
Wufengshania 00-000000111102?10111?1000001l??????????????????????????0
Briagalepis 00-0??????????????????????00??1???000100101001000l1??????0
Monarolepis 00-0??????????????11?01????????000100101001000110l1?1?0
Vietnamaspis 00-00?????1??????????????????????0101000010110O???11???10
Dianolepis 00-0?100011110 2?10?0??000100l1???0101000010010001101O1??0
Tenizolepis 00-0?100011110201??0??01?10?????000100101001000l1?1??1?0
Luquanolepis 00-0??????????????????????????0101000??00100001O1?01?0
Nawagiaspis 00-0?100001??03?10?????1??00110101101O0???00100001O1????0
Jiangxilepis 10-0?1000011102?1000?0011100l????0100100011010010111011?0
Ningxialepis 10-00??????????????0??000????0???1100111O1?011010??1011?0
Kirgisolepis 00-0?1000011002?1??0??10001???1??1100111O1?010010?11????0
Hunanolepis 00-0?100001100301O?01111110010l??1100000011O1001000100110
Wurungulepis 00-01????????????????????????????1?0000001?01000000?????0
Sherbonaspis 00-0?010001100??10?0??111??0101??120000001101001000100000
Stegolepis 0?-0?1100011001?1??0??11110???1??1200100001010000001000?0
Asperaspis 00-0??????????????????????????????0310000001O???001??????0
Byssacanthus 00-0?100001100200?0??11111??01??1100100001010000000100010
Pterichthyodes 00-0110000110O2?1010111101001O1?1110000001101001000100000
Grossaspis 00-1????????????????????????????1100000011010O?0?0?????0
Lepadolepis 00-1????????????????????????????1100000011010O?0?01000?0
Gerdalepis 00-1?000001100000??0??11110???1??1100000011O1001010100000
Walterilepis 00-0?????011001?1??0??10??????1??1??000001101O0?0?01000?0
Pambulaspis 00-0?0110011001111001111110O1?1??0300000011010000000?000?1
Merimbulaspis 00-0?011001100111?00??1??????????03???0101?010000?0??00?1
Asterolepis 00-0101100110011100010111110010l?1030000010101001000100010
Remigolepis 00-0?011001100111001011110010l?10300000001010000000000-0