



http://app.pan.pl/SOM/app68-Plax_Luksevics_SOM.pdf

SUPPLEMENTARY ONLINE MATERIAL FOR

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

Dmitry P. Plax and Ervins Lukševičs

Published in *Acta Palaeontologica Polonica* 2023 68 (3): 513-527.
<https://doi.org/10.4202/app.01075.2023>

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):

$r_1 > 55$ (0);
 $35 \leq r_1 \leq 55$ (1);
 $15 \leq r_1 < 35$ (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);

$300 \leq r_2 \leq 500$ (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-----
?0000000000000000-----
Romundina 00-00100000-0-0-000000-000110000000000000-??0011?-----?00000000-
10000-----
Chuchinolepis 00-0?1000011000-
110?00?000001000000??1??0??013010000000001??000011110-00000-0
Vanchienolepis 00-
0??01301000010??01??000111110-1????-0
Zhanjilepis 00-
0????????????????0????????????????????????013000000000001?100?0????????????-0
Heteroyunnanolepis 00-
0010000111??0110?00?0?000?00?0?0?????0????013000000000001??000011110-0????-0
Yunnanolepis 00-0?1000011000-
110?0000000010000000110000??013000000000011110000?1110-00000-0
Mizia 00-0?1000011000-
110000?0?0011000000????0000?01300000000001111000011110-00000-0
Phymolepis 00-0??0??11??-
11??00000000110?000011000????01300000000001111000011110-00000-0
Parayunnanolepis 00-001000011000-
100?00?0?00110?000????0?0??0130000000000111?000011110-00000-0
Minicrania 00-
0?10000100010100?00?0?0010110100?10?0?0??010010000000001??000011110-0?????0
Liujiangolepis 00-
00100011100??112?10?0??011110000????0????010010010000?010001011111100101000
Xichonolepis 00-
0?100011101??111000?0??0111100?????0????01211001000010100010111110010?000
Dayaoshania 00-
0?100011101??110?10?0??0111100?????0????012110010000??1000101111100100000
Grenfellaspis 00-
0?10001110110110?00?00000111100??1?110????011210010010101000101111110010?00
0
Sinolepis 00-
0?100011001??110?00?0?00011110000????0????010210010010??1000101111110010?000
Wudinolepis
0100?110001100??103?00????001110101?01?????0100100010010010001101111111?0
1?0

Hohsienolepis

0110?110001100??103000?0??001110?????????????010010001001001000110111111?1?0?
?0

Microbrachius 0110?1100011000-

103?0000011001110101001111????01001000100100100011011111111100?0

Bothriolepis 10-0011000111-

111120101111100100101101111101100100100010010010001101111111111110

Grossilepis 00-0?11000111-

11112?10?1?1100100101100??1011?0100100100010010001101111111111110

Wufengshania 00-0010000111-

11102?10111?1101000001001111????????????????????????????1111?????0

Briagalepis 00-

0????????????1?????????????00?????????1????010010101001001000110111111?????0

Monarolepis 00-

0????????????1????????111?0?1?????0111?????01001010100100100011011111011?1?0

Vietnamaspis 00-00??????1-

?1?????????????????????????????????011010001011001?0???011111111????10

Dianolepis 00-0?11000111-

11102?10?0??001010001??1??1?????011010001001001000110111110101?0

Tenizolepis 00-0?11000111-

1110201??0??011?10?????????????010010101001001000110111111?1?1?0

Luquanolepis 00-

0????????????1?????????????????????????????????0110100??0010010000101111101?01?0

Nawagiaspis 00-0?11000101-

?103?10?????11?0001?????10010111010??0010010000101111101????0

Jiangxilepis 10-0?11000101-

11102?1000?0?01111000100111?????0110010011010010010101111111011?0

Ningxialepis 10-

001????1?????1?????0??00?0??1??????0?????11001101?011010010?01?1111?1011?0

Kirgisolepis 00-0?11000101-

10102?1?0??01010011?????????1???111001101?010010010?011111111????0

Hunanolepis 00-0?11000101-

10103010?011?111101010011101??1110000011010010010001111110100110

Wurungulepis 00-

01????????????1?????????????????????????????????11?000001?01001000000111110?????0

Sherbonaspis 00-0?10100101-

1010??10?0??11111??101?????01???1120000011010010010001111110100000

Stegolepis 0?-0?11100101-

10101?1?0??1111101?????????1???11200100010100100000011111101000?0

Asperaspis 00-

0???01310000010???1000010111111?????00

Byssacanthus 00-0?11000101-

10102?00?0??1111111??????01???1110010001010010000001111110100010

Pterichthyodes 00-0111000101-

10102?1010111110101010011101??11110000011010010010001111110100000

Grossaspis 00-

1????????????1?????????????????????????????????11100000110100100?0?01111110?????0

Lepadolepis 00-

1????????????1?????????????????????????????????11100000110100100?0?011111101000?0

Gerdalepis 00-1?10000101-

1010000??0??1111101?????????1???1110000011010010010101111110100000

Walterilepis 00-0?1????101-
 10101?1??0???10????1????????1????11??0000110100100?0?011111101000?0
Pambulaspis 00-0?10110101-
 10101111001111111010100111?1???0130000011010010000001111110?000?1
Merimbulaspis 00-0?10110101-
 1010111?00???1????????0????????013???101?010010000?01111110?00?11
Asterolepis 00-0110110101-
 10101110001011111101010011101??10130000101010010010001111110100010
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):

$r_1 > 55$ (0);
 $35 \leq r_1 \leq 55$ (1);
 $15 \leq r_1 < 35$ (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);
 $300 \leq r_2 \leq 500$ (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 Euanthiarcha

? = 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?0001101010?00?00001110?0?0??01210001001010010010?000
Wudinolepis 0100?100010??03?00??0011001??0001000010010001111?01?0
Hohsienolepis 0110?100010??03000?0?00110?0??00010000100100011?1?0??0
Microbrachius 0110?1000100-03?00000100110011??0001000010010001111100?0
Bothriolepis 10-00100011111201011110000111101000010000100100011111110
Grossilepis 00-0?1000111112?10?1?10000111101?00010001000100011111110
Wufengshania 00-000000111102?10111?10000011?????????????????????0
Briagalepis 00-0????????????????????00??1??00010010100100011?????0
Monarolepis 00-0????????????????11?01????????00010010100100011011?1?0
Vietnamaspis 00-00?????1????????????????????01010000101100??11??10
Dianolepis 00-0?1000111102?10?0?00010011??010100001001000110101??0
Tenizolepis 00-0?100011110201??0??01?10?0??00010010100100011?1??1?0
Luquanolepis 00-0????????????????????0101000?0010000101?01?0
Nawagiaspis 00-0?100001??03?10?????1??0011010110100??0010000101????0
Jiangxilepis 10-0?1000011102?1000?00111001????0100100011010010111011?0
Ningxialepis 10-00??????????????0??000??0??110011101?011010??1011?0
Kirgisolepis 00-0?1000011002?1??0??10001??1??110011101?010010?11????0
Hunanolepis 00-0?1000011003010?01111100101??110000001101001000100110
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????????????????????03100000010??001?????0
Byssacanthus 00-0?1000011002?00?0??11111??01??110010000101000000100010
Pterichthyodes 00-011000011002?101011110100101?1110000001101001000100000
Grossaspis 00-1????????????????????11000000110100?0?0?????0
Lepadolepis 00-1????????????????????11000000110100?0?01000?0
Gerdalepis 00-1?000001100000??0??11110??1??110000001101001010100000
Walterilepis 00-0?????011001?1??0??10?????1??1??00000110100?0?01000?0
Pambulaspis 00-0?01100110011110011111001?1??030000001101000000?000?1
Merimbulaspis 00-0?011001100111?00??1????????03??0101?010000?0?00?1
Asterolepis 00-0101100110011100010111100101?1030000010101001000100010
Remigolepis 00-0?01100110011110010111100101?1030000000101000000000-0