http://app.pan.pl/SOM/app62-Fuente_etal_SOM.pdf

SUPPLEMENTARY ONLINE MATERIAL FOR

Unusual shell anatomy and osteohistology in a new Late Cretaceous panchelid turtle from northwestern Patagonia, Argentina

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Supplementary Online Material

SOM 1. A dataset of 23 taxa and 62 morphological characters.
http://app.pan.pl/SOM/app62-Fuente_etal_SOM/Matrix_R_caldieroi.nex
http://app.pan.pl/SOM/app62-Fuente_etal_SOM/R_caldieroi.tnt
http://app.pan.pl/SOM/app62-Fuente_etal_SOM/results.txt

SOM 2. The list of synapomorphies common to the MPTs.

SOM 3. Taxon list.

SOM 2. Synapomorphies common to 4 trees
(Node numbers refer to nodes in consensus)

Chelydra serpentina:

All trees:

No autapomorphies:

Araripemys barretoi:

All trees:

Orbits position (4): Lateral → Dorsal

Medial process of the Basisphenoid in ventral view (19): Not extending beyond the processus trochlearis pterygoidei or processus pterygoideus externus → Extending until processus trochlearis pterygoidei or processus pterygoideus externus

Lower jaw (22): Fused in midline → Separated by symphyseal suture

Hook development of the lower jaw (23): Present → Absent

Midline fusion on cervical postzygapophyses (26): Absent → Present

Podocnemis sextuberculata:

All trees:

Dorsal portion of parietals (9): Not covering dorsal area of abductor fossa → Covering dorsal area of abductor fossa

Suprapygal posterior contact (38): Pygal and elevnth peripheral bones → Only pygal

Axillar buttresses shape (42): Anterior and posterior edges diverg towards lateral end, whitout medial constriction → Anterior and posterior edges are suparallel medially suddenly narrowing laterally ending in a ridge

Plastron (52): Axillar-inguinal distance shorter than each plastral lobes → Axillar-inguinal distance longer than each platral lobes

Pectoral scute extending over epiplastra (59): Absent → Present

Pectoral scute extending over entoplastron (60): Absent → Present over entoplastron half

Pectoral scute extending over mesoplastra (61): Present → Absent

Some trees:

Orbits position (4): Lateral → Dorso-lateral

Foramen stapedio temporalis (10): Seen in dorsal view → Not seen in dorsal view

Pelomedusa subrufa:

All trees:

Medial process of the Basisphenoid in ventral view (19): Not extending beyond the processus trochlearis pterygoidei or processus pterygoideus externus → Extending until processus trochlearis pterygoidei or processus pterygoideus externus

Peripheral bones (39): Peripheral bones anterior to bridge shorter than posterior one → Peripheral bones anterior to bridge longer than posterior one

Axillar buttresses extention (40): Extend to second to third peripheral, or Extend to third peripheral → Extend to third and fourth peripheral

Some trees:

Axillar buttresses contact with firt costtal rib (41): Axillar buttresses angled between 15 and 50 degrees respet to the rib → Axllar buttresses parallel or adjacent to the costal rib

Mendozachelys wichmanni:

All trees:

No autapomorphies:

Pseudemydura umbrina:

All trees:

Anterior process of frontals relative to nasal (3): Anterior process short, partially separating the nasals → Anterior process absent

Dorsal portion of parietals (9): Not covering dorsal area of abductor fossa → Covering dorsal area of abductor fossa

Supraoccipital-Squamosal contact (12): Absent → Present, through the temporal bar

Incisura columelae auris (20): Closed → Open

Inguinal buttresses (45): Extending onto costal bones → Not extending onto costal bones

Shape of cervical scute (49): 2 → Longer than wide

Gular extending over entoplastron (57): Yes, over anterior half → Yes, over posterior half

Pectoral scute extending over epiplastra (59): Absent →Present

Pectoral scute extending over entoplastron (60): Absent, or Present over entoplastron half → Present over most of the entoplastron

Some trees:

Hook development of the lower jaw (23): Present → Absent

Suprapygal posterior contact (38): Pygal and elevnth peripheral bones → Pygal, eleventh peripheral and tenth peripheral bones

Ischial scar position (56): Extending onto the xiphiplastral tips → Not extending onto the xiphiplastral tips

Elseya dentata:

All trees:

No autapomorphies:

Emydura macquarii:

All trees:

Nuchal bone (34): Wider than long → Longer than wide

Some trees:

Medial contact of palatines (16): Present → Absent

Length of epiplastral suture (53): More than half entoplastral length → Half entoplastral length

Rheodytes leukops:

All trees:

Splenial (21): Present → Absent

Inguinal Buttresses extends over peripherals (44): Peripheral 7, or Peripheral 7 and 8 → Peripheral 6 and 7

Pubic scar position (55): In the medial part of the xiphiplastron → Lateral, located in the margin of the xiphiplastron

Some trees:

Expansion of the paraoccipital process of the opisthotic (8): Expanded → Not expanded

Christa supraoccipital (13): Devloped behind the occipital condyle → Not developed behind the occipital condyle

Myuchelys latisternum:

All trees:

Anterior process of frontals relative to nasal (3): Anterior process short, partially separating the nasals → Anterior process well-developed, completely separating the nasals

Incisura columelae auris (20): Closed → Open

Inguinal buttresses (45): Extending onto costal bones → Not extending onto costal bones

Some trees:

Christa supraoccipital (13): Devloped behind the occipital condyle → Not developed behind the occipital condyle

Axillar buttresses shape (42): Anterior and posterior edges are subparallel, whitout medial constriction , or Anterior and posterior edges are suparallel, but with a medial constriction → Anterior and posterior edges diverg towards lateral end, whitout medial constriction

Platemys platycephala:

All trees:

Postzygapophyses orientation on the atlas (31): Ventro-lateral → Lateral

Illiadic suture restricted to costal bones (46): No → Yes

Some trees:

Expansion of the paraoccipital process of the opisthotic (8): Expanded → Not expanded

Foramen stapedio temporalis (10): Seen in dorsal view → Not seen in dorsal view

Suprapygal posterior contact (38): Pygal and elevnth peripheral bones → Pygal, eleventh peripheral and tenth peripheral bones

Inguinal Buttresses extends over peripherals (44): Peripheral 7 → Peripheral 7 and 8

Length of epiplastral suture (53): Half entoplastral length → More than half entoplastral length

Acanthochelys macrocephala:

All trees:

Orientation of postzygapohyses on cervical vertebra 8 (30): Ventro-lateral → Lateral

Some trees:

Length of epiplastral suture (53): Half entoplastral length, or More than half entoplastral length → Half entoplastral length

Mesoclemmys nasuta:

All trees:

Supraoccipital-Squamosal contact (12): Absent → Present, through the temporal bar

Some trees:

When the illiadic suture reaches the suprapygal (47): Reaches only costal 8 → Reaches also costals 7 and 8

Phrynops hilarii:

All trees:

Inguinal Buttresses extends over peripherals (44): Peripheral 7 → Peripheral 7 and 8

Some trees:

Inguinal buttresses extends over costals (43): Costal 5 → Costal 5 and 6

Chelodina oblonga:

All trees:

Anterior process of frontals relative to nasal (3): Anterior process short, partially separating the nasals → Anterior process well-developed, completely separating the nasals

Medial contact of palatines (16): Absent → Present

Suprapygal posterior contact (38): Pygal and elevnth peripheral bones → Pygal, eleventh peripheral and tenth peripheral bones

Inguinal buttresses (45): Extending onto costal bones → Not extending onto costal bones

Gular extending over entoplastron (57): Yes, over anterior half → Yes, over posterior half

Extragulars (58): Present and not contacting in middline → Present and contacting in midline

Pectoral scute extending over epiplastra (59): Absent → Present

Some trees:

Neural series (35): Neural bones forming a continuous series not reaching the suprapygal bones → Neural bones forming a discontinuous series without nuchal bone contact

Chelus fimbriatus:

All trees:

Nasals (1): Present → Absent

Orientation of postzygapohyses on cervical vertebra 8 (30): Ventro-lateral → Lateral

Postzygapophyses orientation on the atlas (31): Ventro-lateral → Dorso-lateral

Costo-vertebral tunnel (33): Slightly developed → Developed through dorsal vertebrae serie

Axillar buttresses contact with firt costtal rib (41): Axllar buttresses parallel or adjacent to the costal rib → Axillar buttresses angled between 15 and 50 degrees respet to the rib

Pubic scar position (55): In the medial part of the xiphiplastron → Lateral, located in the margin of the xiphiplastron

Ischial scar position (56): Not extending onto the xiphiplastral tips → Extending onto the xiphiplastral tips

Some trees:

Quadrate-Basisphenoid contact (7): Present → Absent

When the illiadic suture reaches the suprapygal (47): Reaches only costal 8 → Reaches also costals 7 and 8

Hydromedusa tectifera:

All trees:

Orientation of postzygapohyses on cervical vertebra 8 (30): Ventro-lateral → Ventral

Axillar buttresses extention (40): Extend to third and fourth peripheral → Extend to fourth peripheral

Vertebral B (51): Vertebral 1 wider than vertebral 2 → Vertebral 1 equal or narrower than vertebral 2

Some trees:

When the illiadic suture reaches the suprapygal (47): Reaches only costal 8 → Reaches also costals 7 and 8

Yaminuechelys gasparinii:

All trees:

No autapomorphies:

Yaminuechelys maior:

All trees:

No autapomorphies:

Rionegrochelys caldieroi:

All trees:

Costo-vertebral tunnel (33): Slightly developed → Developed through dorsal vertebrae serie

Pectoral scute extending over entoplastron (60): Absent → Present over entoplastron half

Bonapartemys bajobarrealis:

All trees:

Axillar buttresses shape (42): Anterior and posterior edges are subparallel, whitout medial constriction → Anterior and posterior edges are suparallel medially suddenly narrowing laterally ending in a ridge

Plastron (52): Axillar-inguinal distance shorter than each plastral lobes → Axillar-inguinal distance longer than each platral lobes

Gular extending over entoplastron (57): Yes, over anterior half → Yes, over posterior half

Lomalatachelys neuquina:

All trees:

Suprapygal posterior contact (38): Pygal and elevnth peripheral bones → Pygal, eleventh peripheral and tenth peripheral bones

Illiadic suture restricted to costal bones (46): No → Yes

Prochelidella portezuelae:

Some trees:

Axillar buttresses contact with firt costtal rib (41): Axillar buttresses angled between 15 and 50 degrees respet to the rib → Axllar buttresses parallel or adjacent to the costal rib

Node 24 :

All trees:

No synapomorphies

Node 25 :

All trees:

Quadrate-Basisphenoid contact (7): Absent → Present

Orientation of dorsal process of neural arch in cervical vertebrae 3-7 (29): Between 30 degrees and 40 degrees respect to vertebral body → More than 40 degrees with respect to vertebral body

Nuchal bone (34): Wider than long → Longer than wide

Illiadic suture restricted to costal bones (46): No → Yes

Node 26 :

All trees:

Incisura columelae auris (20): Open → Closed

Relative length of neural arch on 3-7 cervical vertebrae (25): Longer than wide of vertebral body → Shorter than wide of vertebral body

Orientation of dorsal process of neural arch in cervical vertebrae 3-7 (29): Less than 30 degrees with respect to vertebral body → Between 30 degrees and 40 degrees respect to vertebral body

Orientation of postzygapohyses on cervical vertebra 8 (30): Ventral → Ventro-lateral

Neural series (35): Neural bones forming a continuous serie reaching the suprapygal bonee → Neural bones forming a continuous series not reaching the suprapygal bones

Neural bones shape (36): Irregular → Regular

Vertebral A (50): Vertebral scute wider than pleural scute → Vertebrall scute narrow than pleural scute

Some trees:

Mesoplastron (54): Absent → Longer than wide or squarrish

Node 27 :

All trees:

Nuchal bone (34): Wider than long → Longer than wide

Peripheral bones (39): Peripheral bones anterior to bridge shorter than posterior one → Peripheral bones anterior to bridge longer than posterior one

Node 28 :

All trees:

Axillar buttresses shape (42): Anterior and posterior edges diverg towards lateral end, whitout medial constriction → Anterior and posterior edges are subparallel, whitout medial constriction

Inguinal buttresses extends over costals (43): Costal 5 → Costal 5 and 6

Node 29 : Clade with the extinct forms

All trees:

Pubic scar position (55): In the medial part of the xiphiplastron → Lateral, located in the margin of the xiphiplastron

Ischial scar position (56): Not extending onto the xiphiplastral tips → Extending onto the xiphiplastral tips

Some trees:

Inguinal Buttresses extends over peripherals (44): Peripheral 7 → Peripheral 7 and 8

Mesoplastron (54): Longer than wide or squarrish → Wider than long

Node 30 : Pan-Chelidae

All trees:

Splenial (21): Absent → Present

Cervical centrum (24): 3-8 procoelous → Only 6 procoelus

Some trees:

Medial ventral crest on 8 cervical vertebrae (27): Absent → Slightly development without covering all vertebral body length

Inguinal Buttresses extends over peripherals (44): Peripheral 7 → Peripheral 7, or Peripheral 7 and 8

Vertebral B (51): Vertebral 1 equal or narrower than vertebral 2 → Vertebral 1 wider than vertebral 2

Node 31 : Crown-group Chelidae

All trees:

Neural series (35): Neural bones forming a continuous series not reaching the suprapygal bones → Absent

Shape of cervical scute (49): Squarish or wider than long → 2

Some trees:

Expansion of the paraoccipital process of the opisthotic (8): Expanded → Not expanded

Peripheral bones (39): Peripheral bones anterior to bridge shorter than posterior one → Peripheral bones anterior to bridge longer than posterior one

Mesoplastron (54): Longer than wide or squarrish → Absent

Node 32 :

All trees:

Dorsal process of the exoccipital (14): Whitout contact in midline over the foramen magnum → Contact in midline over the foramen magnum

Medial process of the Basisphenoid in ventral view (19): Not extending beyond the processus trochlearis pterygoidei or processus pterygoideus externus → Extending beyond the processus trochlearis pterygoidei or processus pterygoideus externus

Lower jaw (22): Fused in midline → Separated by symphyseal suture

Nuchal bone (34): Wider than long → Longer than wide

Axillar buttresses extention (40): Extend to second to third peripheral, or Extend to third peripheral → Extend to third and fourth peripheral

Some trees:

Orbits position (4): Lateral → Dorso-lateral

Christa supraoccipital (13): Devloped behind the occipital condyle → Not developed behind the occipital condyle

Medial contact of palatines (16): Present → Absent

Hook development of the lower jaw (23): Present → Absent

Axillar buttresses contact with firt costtal rib (41): Axillar buttresses angled between 15 and 50 degrees respet to the rib → Axllar buttresses parallel or adjacent to the costal rib

Vertebral B (51): Vertebral 1 equal or narrower than vertebral 2 → Vertebral 1 wider than vertebral 2

Node 33 :

All trees:

Neural series (35): Absent → Neural bones forming a continuous series not reaching the suprapygal bones, or Neural bones forming a discontinuous series without nuchal bone contact

Some trees:

Quadrate-Basisphenoid contact (7): Absent → Present

Node 34 :

All trees:

Lateral edges of the dorsal portion of parietals (11): Reduced at medial portion → Tapering posteriorly

Incisura columelae auris (20): Closed → Open

Relative length of neural arch on 3-7 cervical vertebrae (25): Shorter than wide of vertebral body → Longer than wide of vertebral body

Midline fusion on cervical postzygapophyses (26): Absent → Present

Orientation of dorsal process of neural arch in cervical vertebrae 3-7 (29): Between 30 degrees and 40 degrees respect to vertebral body → Less than 30 degrees with respect to vertebral body

Neural arch elements of the atlas (32): Dorsally sutured → Dorsally fused

Node 35 :

All trees:

Orbits position (4): Dorso-lateral → Dorsal

Palatines separated in midline (17): Separated by vomer → Separated by pterygoides

Medial process of the Basisphenoid in ventral view (19): Extending beyond the processus trochlearis pterygoidei or processus pterygoideus externus → Extending until processus trochlearis pterygoidei or processus pterygoideus externus

Inguinal Buttresses extends over peripherals (44): Peripheral 7 → Peripheral 6 and 7

Shape of cervical scute (49): 2 → Longer than wide

Some trees:

Length of epiplastral suture (53): More than half entoplastral length → Half entoplastral length

Node 36 :

All trees:

Supraoccipital-Squamosal contact (12): Absent → Present, through the temporal bar

Relatively large bony apertura narinum internae (18): Absent → Present

Postzygapophyses orientation on the atlas (31): Ventro-lateral → Ventral

Shape of cervical scute (49): Longer than wide → Squarish or wider than long

Node 37 :

All trees:

Quadrate (6): Not forming part of the temporal arch → Laterally expanded, forming part of temporal arch

Costo-vertebral tunnel (33): Slightly developed → Developed narrowing toward posterior edge

Peripheral bones (39): Peripheral bones anterior to bridge longer than posterior one → Peripheral bones anterior to bridge shorter than posterior one

Axillar buttresses extention (40): Extend to third and fourth peripheral →Extend to third peripheral

Inguinal Buttresses extends over peripherals (44): Peripheral 6 and 7 → Peripheral 7

Mesoplastron (54): Absent → Wider than long

SOM 3. Taxon list.

Chelydra serpentina (photographs: MNHNP-AC 1870-465)

Araripemys barretoi (drawings from Meylan 1996)

Pelomedusa subrufa (photographs: AMNH 131262, NHMUK 87.3.11.10, specimen handled: SMF 7953)

Podocnemis sextuberculata (photographs: NHMUK 1947.3.5.83, NHMUK 16075, specimens handled: SMF 65274, MHNSR H-2501)

Rionegrochelys caldieroi (specimens handled: MPCA-AT 258, MPCA-AT 26, MPCA-AT 29, MPCA-AT 30)

Bonapartemys bajobarrealis (specimen handled: MACN-CH-1469)

Lomalatachelys neuquina (photographs and drawings from Lapparent de Broin and de la Fuente 2001 from MOZ 5117P)

Mendozachelys wichmanni (specimen handled: MACN-M-02)

Prochelidella portezuelae (specimen handled: MCF-PVPH-161)

Yaminuechelys gasparinii (photographs and drawings: MPA 86-86-IC)

Yaminuechelys maior (specimens handled: MPEF PV 1273, MPEF PV 1274, MPEF PV 1930, MPEF PV 1932, MPEF PV 1939, MPEF PV 599, MPEF PV 627)

Pseudemydura umbrina (specimen handled: NMW 1296, photographs: WAM R29338, WAM R 29348)

Rheodytes leukops (photographs and drawings from Legler and Cann 1980: UU 17114; photographs: QM J 76293, QM J 85198, QM J 85199)

Emydura macquarii (specimens handled: NBM C 1774, NBM C 2138, photographs: QM J 61586, NHMUK 26.8.26.5, NHMUK 86.8.26.5)

Elseya dentata (photographs: QM J 59279, QM J 59280, NHMUK 76.5.19.27)

Myucheys latisternum (photographs: NHMUK 71.9.25.8, CRI 6572, CRI 6573, specimens handled: NMW 17224, NBM C 1453)

Chelodina oblonga (photographs: NHMUK 64.12.22.6, CRI 4632, CRI 5067)

Platemys platycephala (photographs: FMNH 45659, MNHN 1979-8304, specimens handled: MHNSR H-1554, MZUSP 2786

Acanthochelys macrocephala (specimen handled: MZUSP 3069)

Mesoclemmys nasuta (specimens handled: MACN-H-11967, ZSM 1-1925; photographs: NHMUK 1936.7.5.1)

Phrynops hilarii (specimens handled: SMF 33058, SMF 33670, NMW 30564, MNHNP-AC-A-5183, MHNSR H-1550; photographs: NHMUK 86-3-10-1)

Chelus fimbriatus (specimens handled: MZUSP 2619, MHNSR H-2133, SMF 37146, NMW 39830, NMW 39245, NMW 1859, NBM C 1682, MNHNP-AC 1930-365; photographs: USNM 64154, FMNH 22113, AMNH 70638)

Hydromedusa tectifera (specimens handled: NMW 1826, NMW 1827, NMW 34629, NBM C 2024, MNHNP-AC-1870-9, MNHN-AC-1874-394, SMF 7992, SMF 7996, SMF 50238, MHNSR H-1614, uncatalogued specimens from MMHNSR; photographs: AMNH 64519, AMNH 133629).

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Meylan, P.A. 1996. Skeletal morphology and relationships of the Early Cretaceous side necked turtle, *Araripemys barretoi* (Testudines: Pelomedusoides: Araripemydidae), from the Santana Formation of Brazil. *Journal of Vertebrate Paleontology* 16: 20–33.