

Online Supplementary Material

A large peltopleurid fish (Actinopterygii: Peltopleuriformes) from the Middle Triassic of Yunnan and Guizhou, China

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1. Taxa and principal sources of data

NHMUK, Natural History Museum, London, UK;

IVPP, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing, China

PIMUZ, Paläontologisches Institut und Museum, Universität Zürich, Zürich, Switzerland

ZMNH, Zhejiang Museum of Natural History, Hangzhou, China

Pteronisculus stensi ♂: Nielsen, 1942; NHMUK P16282, 16283, 16300, 163001, 16307–16308

Acipenser brevirostrum: Hilton et al., 2011

Amia calva: Grande and Bemis, 1998

Australosomus kochi: Nielsen, 1949; NHMUK P17141–17143, 17156, 17157, 17160, 17161, 20940–20945

Caturus furcatus: FMNH UC2057; Patterson 1975; Grande and Bemis 1998

Cleithrolepidina minor: Hutchinson, 1973

Cleithrolepis granulate: Wade, 1935; Hutchinson, 1973

Elops: Forey, 1973

Gigantopterus teller: Griffith, 1977

Habroichthys minius: B ürgin, 1992; PIMUZ T196, 233, 2917, 2883, 2884

Lepisosteus osseus: Grande, 2010

Leptolepis coryphaenoides: Patterson, 1975; Arratia, 1997, 1999, 2013

Luganoia lepidosteoides: B ürgin, 1992; PIMUZ T3003, 3211, 3063

Peltoperleidus macrodontus: B ürgin, 1992

Peltopleurus rugosus: B ürgin, 1992; PIMUZ T2904

Peltopleurus lissocephalus: B ürgin, 1992; PIMUZ T1195

Peltopleurus nitidus: Xu and Ma, 2016

Peltopleurus orientalis: IVPP V2432, 20455–20459

Peripeltopleurus hypsisomus: B ürgin, 1992; PIMUZ T1211, 2150, 2869

Teffichthys (‘*Perleidus*’) *madagascariensis*: NHMUK P16247, 16248, 19580–19584, 19587–19592, 19595–19599, 19603–19620, 19622, 19623; Lehman, 1952; Patterson, 1975

Plesiofuro mingshuica: Xu et al., 2015

Platysiagum minus: B ürgin, 1992

Polzbergia brochatus: Griffith, 1977

Potanichthys xingyiensis: Xu et al., 2012

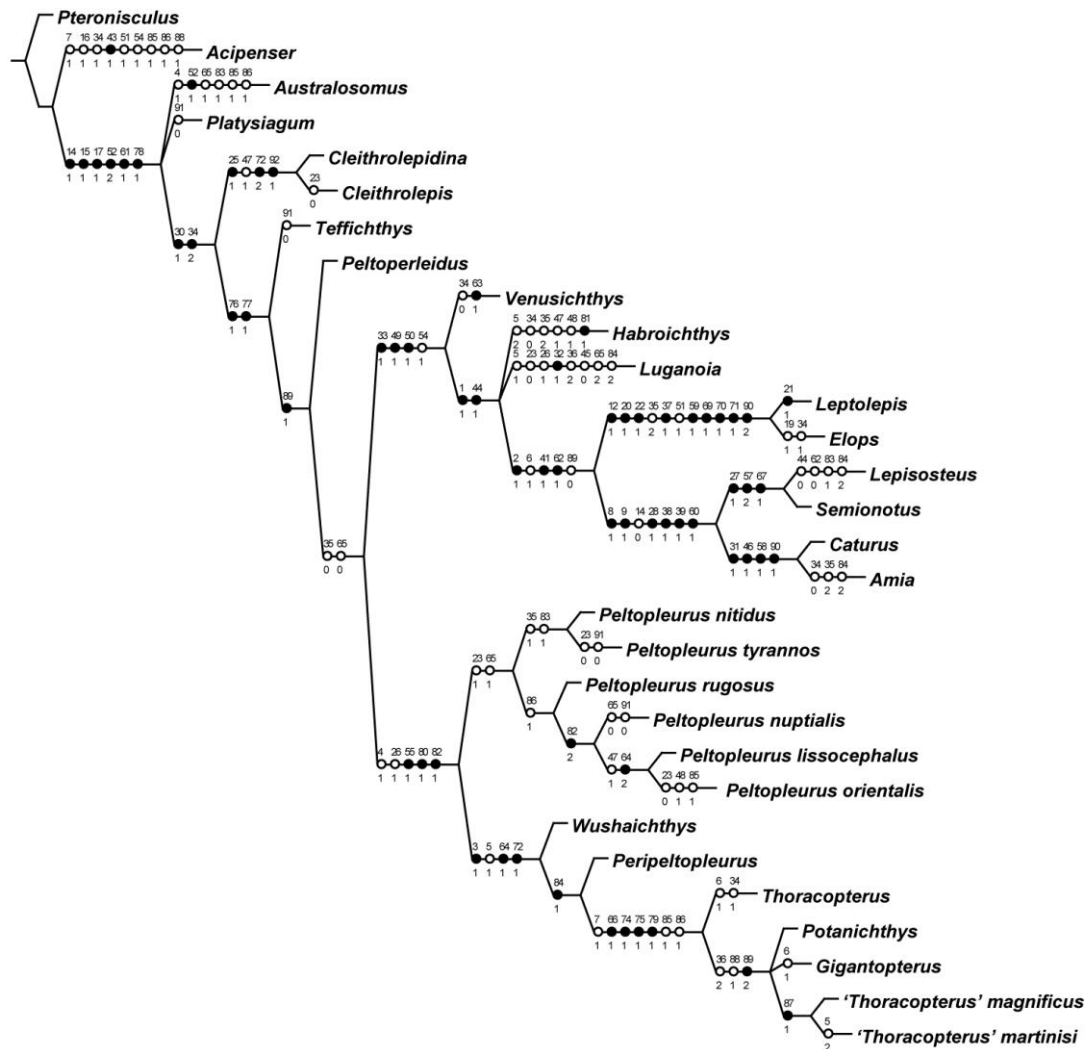
Semionotus elegans: Olsen and McCune, 1991; Grande, 2010; Cavin, 2010; López-Arbarello, 2012

Thoracopecterus niederristi: Griffith, 1977; Lehman, 1979; NHMUK P1098

Venusichthys comptus: Xu and Zhao, 2016

Wushaichthys exquisitus: Xu et al., 2015

2. Supplementary Figure



Supplementary Figure S1. Strict consensus of 18 MPTs (TL=186 steps, CI= 0.586, RI=0.780), illustrating phylogenetic position of *Peltopleurus tyrannos* sp. nov. Character changes indicated with solid circles are unique.

3. Character list

The characters are mainly adopted or modified from previous publications on the phylogenetic relationships of the Neopterygii (A, Arratia, 2013; C, Coates, 1999; CA, Cloutier and Arratia, 2004; GS, Gardiner and Schaeffer, 1989; GML, Gardiner, Maisey and Littlewood, 1996; GSM, Gardiner, Schaeffer and Masserie, 2005); GB, Grande and Bemis, 1998; G, Grande, 2010; LZ, López-Arbarello and Zavattieri, 2008; P, Pinna, 1996; XG, Xu and Gao, 2011; XW, Xu and Wu, 2012; X, Xu et al., 2012; XGF, Xu, Gao and Finarelli, 2014; XZS, Xu, Zhao and Shen, 2015; XZ, Xu and Zhao, 2016; XM, Xu and Ma, 2016).

Skull Roof and Neurocranium

- (1) Rostral: large, shield-like or cap-like (0); small, much reduced or lost by fusion with other elements (1). (Modified from GML19; XW17; XM1)
- (2) Rostral/frontal contact: present (0); absent (1). (Modified from GML19; XM2)
- (3) Frontal: elongate (0); laterally expanded (1). (X33; XM3)
- (4) Supraorbital sensory canal: ending in parietal (0); ending in frontal (1). (X34; XZS34; XM4)
- (5) Distinct parietal: present (0); absent, fused with dermopterotic (1); absent, fused with frontal and dermopterotic (2). (Modified from XZS28; XM5)
- (6) Nasal bones: completely separated from each other by broad median rostral or rostral bones (0); joined or nearly joined in midline (1). (XM6)
- (7) Nasal bone forming part of orbital margin: present (0); absent (1). (XZ55; XM7)
- (8) Sphenotic with small dermal component: absent (0); present (1). (G23; XW16; XM8)
- (9) Pterotic: present (0); absent (1). (GML2; XM9)
- (10) Opisthotic: present (0); absent (1). (G33; XM10)
- (11) Intercalar: present (0); absent (1). (GML4; XM11)
- (12) Supraoccipital: absent (0); present (1). (G28; XM12)
- (13) Post-temporal fossa: absent (0); present (1). (GS28; XM13)
- (14) Sub-temporal fossa: absent (0); present (1). (GS29; XM24)
- (15) Dilatator fossa: absent (0); present (1). (GS31; XM15)
- (16) Posterior myodome: present (0); absent (1). (Modified from GS10; GSM6; XM16)
- (17) Anterodorsal myodome: present (0); absent (1). (XGF8; XZ8; XM17)
- (18) Parasphenoid: short, terminates at otic fissure (0); medium, extends across otic fissure but not

- contact basioccipital (1); long, extends to basioccipital (2). (Modified from GSM8; XM18)
- (19) Basipterygoid process: present (0); absent (1). (GSM12; XM19)
- (20) Internal carotid foramen on parasphenoid: absent (0); present (1). (GML14; XM20)
- (21) Efferent pseudobranchial foramen on parasphenoid: absent (0); present (1). (GML15; XM21)
- (22) Vomers in adults: paired (0); fused (1). (XZS32; XM22)
- (23) Number of extrascapulars: two pairs or more (0); three (1); one pair (2). (Modified from X16; XM23)
- (24) Intertemporal: present (0); absent (1). (Modified from GSM17; XM24)
- (25) Accessory dermopterotic: absent (0); present (1). (Hutchinson, 1973; XM25)
- (26) Dermopterotic/preopercle contact: present (0); absent (1). (XM26)

Circumorbital Bones

- (27) Number of lachrymal bone(s): single (0); two or more (1). (G21; XW24; XM27)
- (28) Tube-like canal bearing anterior arm of antorbital: absent (0); present (1). (G12; XW19; XM28)
- (29) Dermosphenotic/nasal contact: present (0); absent (1). (Modified from GS19; XM29)
- (30) Shape of dermosphenotic: elongate (0); keystone-shaped (1). (XZ18; XM30)
- (31) Dermosphenotic attachment to skull roof in adult-sized individuals: loosely attached on the skull roof or hinged to the side of skull roof (0); firmly sutured into skull roof, forming part of it (1). (GB56; XM31)
- (32) Anterior infraorbital fused with maxilla: absent (0); present (1). (XM32)
- (33) Number of infraorbitals between antorbital and dermosphenotic: two or three (0); four or more (1). (Modified from GS21; XM33)
- (34) Supraorbital: absent (0); single (1) two or more (2). (GS14; XM34)
- (35) Suborbital: two or more (0); single (1); absent (2). (Modified from GS9; XM35)

Jaws

- (36) Distinct premaxilla: absent (0); present as a pair of elements (1) fused as a median element (2). (Modified from X30; XM36)
- (37) Mobile premaxilla: absent (0); present (1). (Modified from GS24; XM37)
- (38) Premaxilla immovably attached to braincase by means of a deep nasal process tightly sutured to frontals: absent (0); present (1). (G6; XW30; XM38)

- (39) Foramen for olfactory nerve on premaxilla: absent (0); present (1). (Modified from G8; XW20; XM39)
- (40) Maxilla/preopercle contact: present (0); absent (1). (C15; XM40)
- (41) Supramaxilla: absent (0); present (1). (Modified from GS22; XM41)
- (42) Number of supramaxilla: single (0); two (1). (XZ28; XM42)
- (43) Maxilla: present (0); absent (1). (XM43)
- (44) Mobile maxilla in cheek: absent (0); present (1). (C16; XM44)
- (45) Suborbital/maxilla contact: present (0); absent (1). (Modified from CA88; XM45)
- (46) Posterior margin of maxilla: straight or slightly convex (0); concave with a posterior maxillary notch (1). (GB62; XW46; XM46)
- (47) Teeth on maxilla: present (0); much reduced or lost (1). (Modified from LZ11; XM47)
- (48) Teeth on dentary: present (0); absent (1). (XM48)
- (49) Quadratomandibular articulation: behind and below orbit (0); anterior to posterior border of orbit (1). (Modified from LZ2; X56; XM49)
- (50) Coronoid process: absent (0); present (1). (GS17; XM50)
- (51) Supra-angular bone in lower jaw: present (0); absent (1). (A67; XM51)

Palatoquadrate, Hyoid Arch, and Operculo-gular Series

- (52) Suspensorium angle: acute, 30–50 °; hyoid facet directed posteroventrally (0); moderately acute, 60–80 °(1); nearly vertical, 80–90 °; hyoid facet horizontal (2). (Modified from GSM29; XM52)
- (53) Hyomandibular with canal for hyoid branch of nerve VII: absent (0); present (1). (Modified from C22; XM53)
- (54) Dermohyal: present (0); absent (1). (Modified from GSM24; XM54)
- (55) Postspiracle: absent (0); present (1). (XM55)
- (56) Quadratojugal: plate-like, overlying quadrate (0); much reduced or lost (1). (Modified from GSM26; C20; XM56)
- (57) Symplectic: absent (0); present, contacting quadrate (1); present, separated from quadrate by quadratojugal (2). (Modified GSM13; XM57)
- (58) Symplectic involvement of jaw joint: absent (0); present (1). (GB61; G49; XW37; XM58)
- (59) Elongated posteroventral process of quadrate: absent (0); present (1). (Modified from

GML24; XM59)

- (60) Number of hypobranchials: three (0); four (1). (G99; XW42; XM60)
- (61) Uncinate processes on epibranchials: absent (0); present (1). (C25; XM61)
- (62) Interopercle: absent (0); present (1). (GS18; XM62)
- (63) Two or more preopercular elements on each side of skull: absent (0), present (1). (XZ39; XM63)
- (64) Shape of preopercle: boomerang-shaped or irregular (0); narrow and vertical, bearing a tapering anterior process (1); narrow and vertical, without a distinct anterior process (2); crescent-shaped or L-shaped (3). (XZ40; XM64)
- (65) Size of opercle: more than 2.5 times as large as subopercle (0); about 1.5–2 times as large as subopercle (1); roughly equal to or smaller than subopercle (3). (Modified from XW43; XM65)
- (66) Suture between opercle and subopercle: slightly inclined or horizontal (0); greatly inclined (1). (XM66)
- (67) Median gular: present (0); absent (1). (Modified from C11; XM67)

Vertebrate and Caudal Skeleton

- (68) Solid vertebral centra of adult-sized individuals: absent (0); present (1). (Modified from GB4; XM68)
- (69) Epipleural intermuscular bones: absent (0); present (1). (A103; XM69)
- (70) Uronerual: absent (0); present (1). (XW56; XM70)
- (71) Division of hypurals into dorsal and ventral groups (a gap between hypurals 2 and 3): absent (0); present (1). (XZS69; XM71)

Girdles and Fins

- (72) Posttemporal: contacting extrascapular posteriorly (0); contacting extrascapular posteromedially and separating this bone from contact with its counterpart (1); lost (2). (Modified from X27; XM72)
- (73) Clavicle: present as a broad plate (0); much reduced or lost (1). (Modified from GML37; XM73)
- (74) Pectoral fins enlarged as wings: absent (0); present (1). (X66; XM74)
- (75) Pelvic fins enlarged as auxiliary wings: absent (0); present (1). (X70; XM75)

- (76) Median fins (except caudal fin): rays more numerous than radials (0); rays and radials nearly equal in number (1). (GSM31; XM76)
- (77) Dorsal and anal fin rays: segmented throughout the length (0); segmented distally (1).
(Modified from XG62; XM77)
- (78) Caudal fin rays: terminate at caudal extremity of body axis (0); extend beyond termination of body axis (1). (Modified from GSM32; XM78)
- (79) Dense lepidotrichial segments of pectoral fin rays between innermost principle pectoral fin ray and body: absent (0); present (1). (X71; XM79)
- (80) Dense brush-like rays proximally articulating several stout segments at posterior portion of male anal fin: absent (0); present (1). (Modified from XZS74; XM80)
- (81) Modification of male anal fin into unsegmented rays with tiny hooklets along anterior margin of longest leading ray: absent (0); present (1). (XM81)
- (82) Enlarged and posteriorly extended lateral scutes associate with anal fin: absent (0); relatively small, ending at anterior portion of male anal fin base (1); much enlarged; ending at middle or posterior portion of male anal fin base (2). (XM82)
- (83) Anal fin relative to dorsal fin in size: anal fin smaller than or equal to dorsal fin (0); anal fin larger than dorsal fin (1). (XM83)
- (84) Caudal fin: forked, lower lobe slightly shorter than or largely equal to upper lobe (0); forked, lower lobe longer than upper lobe (1); unforked (2). (Modified from X76; XM84)
- (85) Fringing fulcra on caudal fin: present (0); absent (1). (XM85)
- (86) Fringing fulcra on pectoral fins: present (0); absent (1). (XM86)

Scales

- (87) Scales: present (0); absent (1). (Modified from XGF67; XM87)
- (88) Peg-and-socket articulation between scales: present (0); absent (1). (GS3; XM88)
- (89) Anterior lateral line scales: as deep as or slightly deeper than those scales above or below lateral line (0); greatly deepened (1); lost (2). (Modified from XZS83; XM89)
- (90) Type of scales: ganoid or lepisosteoid type (0); elasmoid of amioid type (1); elasmoid of cycloid type (2). (A156; X80; XM90)
- (91) Posterior margin of ganoid scale: serrated (0); smooth (1). (A159; XM90)
- (92) Posteriorly inclined scales in pectoral region: absent (0); present (1). (LZ24; XM92)

Pteronisculus

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Luganoia

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Caturus

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Amia

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Semionotus

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Leptolepis_

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Elops

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