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New data on the ichthyosaur (*Platypterygius hercynicus*) and its implications for the validity of the genus

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SOM 1

Evaluation of the autapomorphic features that have been proposed for *Platypterygius* and *Myopterygius* since Huene (1922). All features are either shared by other Ophthalmosauridae or fail to encompass all species currently referred to as *Platypterygius*, or both.

Ref.	Diagnostic character proposed	Shared by	Not found in	Reference
Huene, 1922 (*Platypterygius*)	Large skull	*Brachypterygius* *Caypullisaurus*		McGowan, 1976 Fernández, 1997
	Short post-orbital region	*Ophthalmosaurus* *Aegirosaurus* *Nannopterygius*	 All *Platypterygius* spp.	Kirton, 1983 Bardet and Fernández, 2000; pers. obs. Kirton, 1983 Pers. obs.
	Long body	Subjective		
	Short caudal fin	Poorly known in Ophthalmosauridae		
	Dicephalous thoracic ribs	All Thunnosaurian ichthyosaurs		Maisch and Matzke, 2000
	Humerus with two distal facets	*Nannopterygius* New Ophthalmosauridae	 Only found in *P. platydactylus*	Kirton, 1983 Fischer et al., in review Broili, 1907
	Longipinnate	Many Ophthalmosauridae	*P. hautali*	Fernández and Aguirre-Urreta, 2005
	Broad forefin thanks to sesamoid elements	Many Ophthalmosauridae		e.g. Motani, 1999

	Not much reduced hindfin	*Undorosaurus* New Ophthalmosauridae		Efimov, 1999 Fischer et al., in review
Huene, 1922 (*Myopterygius*)	Slender snout	Many Ophthalmosauridae	*Platypterygius* sp. *P. campylodon* *P. platydactylus*	Sirrotti and Pappazzoni, 2002; Fischer, unpub. data Kiprijanoff, 1881 Broili, 1907
	Maxilla with long posterior (sic) extension, nearly reaching nostril	Meaning unclear		
	Teeth with bulbous roots	*Brachypterygius* *Undorosaurus* *Maiaspondylus* *Brachypterygius*		McGowan, 1976 Efimov, 1999 Maxwell and Caldwell, 2006a McGowan, 1976
	Presence of a dentine ring	*Ophthalmosaurus icenicus* *Brachypterygius* New Ophthalmosauridae *Maiaspondylus*		Kirton, 1983 McGowan, 1976 Fischer, in prep Maxwell and Caldwell, 2006a
	Crown with sharp longitudinal ridges	*Ophthalmosaurus* *Brachypterygius* *Aegirosaurus*	 *P. americanus*	Kirton, 1983 McGowan, 1976 Fischer et al., 2011 Nace, 1941
	Enormous trochanters on humeri and femora	*Caypullisaurus?* New Ophthalmosauridae	 *P. ochevi* *Platypterygius* sp.	Fernández, 1998; 2007a Fischer et al., in review Arkhangelsky et al., 2008 Choo, 1999; Fischer, unpub. data
	Latipinnate	Many Ophthalmosauridae	 Only found in *P. hautali*	 Fernández and Aguirre-Urreta, 2005
McGowan, 1972	More than one preaxial digit	Some *Otschevia* *Plutoniosaurus*		Arkhangelsky, 2001 Efimov, 1997
	Overall digital count ≥ seven	*Caypullisaurus* *Aegirosaurus* *Plutoniosaurus*		Fernández, 2001 Bardet and Fernández, 2000 Efimov, 1997
	Three primary digits (=longipinnate)	Many Ophthalmosauridae	 *P. hautali*	 Fernández and Aguirre-Urreta, 2005
	Maximum # elements longest digit ≥ 19	*Caypullisaurus* (23) *Aegirosaurus* (20)	 *P. platydactylus*	Fernández, 2001 Bardet and Fernández, 2000 Broili, 1907
	Stout, crescentic pisiform articulating with ulna, ulnare, and humerus		*P. campylodon* *P. platydactylus*	Kiprijanoff, 1881 Broili, 1907
	Humerus with large trochanters	New Ophthalmosauridae *Caypullisaurus* *Brachypterygius*		Fischer et al., in review Fernández, 1998 McGowan and Motani, 2003
	Two to three distal facets, including one for pisiform	Equivocal		
	Irregular pentagon-shaped intermedium with no humerus contact	New Ophthalmosauridae Other "Longipinnates"	 *P. hautali*	Fischer et al., in review Fernández and Aguirre-Urreta, 2005
	Carpals and phalanges with straight edges	*Caypullisaurus* *Maiaspondylus* New Ophthalmosauridae		Fernández, 1997 Maxwell and Caldwell, 2006a Fischer et al., in review
	Polygonal carpals with median constriction	Same as previous character		
	Distal phalanges probably never lose proximal articular contact	Assumption		
	Digital bifurcation probably never occurs	All Ophthalmosauridae		e.g. Motani, 1999

	Maxilla extremely long anteriorly	*Brachypterygius*		McGowan, 1976
			P. campylodon	Kiprijanoff, 1881
			Platypterygius sp.	Sirrotti and Pappazzoni, 2002; Fischer, unpub. data
	Snout ratio ≥ 0.68	*Aegirosaurus* (some specimens)		Bardet and Fernández, 2000
		Caypullisaurus		Bardet and Fernández, 2000
		Brachypterygius		Bardet and Fernández, 2000
			Only found in *P. americanus*; *P. sachicarum*	Romer, 1968; Paramo, 1997
	Orbital ratio < 0.15		*P. hercynicus*	This work
	Smaller sclerotic aperture	Ontogenetically variable		Fernández et al., 2005
	Tooth present and stout	*Undorosaurus*		Efimov, 1999
		Maiaspondylus		Maxwell and Caldwell, 2006a
		Brachypterygius		McGowan, 1976
	No basioccipital peg	Most Ophthalmosauridae		Maxwell, 2010
	Very stout stapes with round head	Autapomorphic of *Stenopterygius* + Ophthalmosauridae		Fischer et al., in review
	Adult skull > 1 m	*Brachypterygius*		McGowan, 1976
		Caypullisaurus		Fernández, 1997
Bardet, 1990	Quadrangular root section	*Undorosaurus*		Efimov, 1999
		Maiaspondylus		Maxwell and Caldwell, 2006a
		New Ophthalmosauridae		Fischer et al., in review
Maisch and Matzke, 2000	Low-crowned skull	Meaning unclear		
	Long snout	*Aegirosaurus*		Bardet and Fernández, 2000; Fischer et al., 2011
		Some *Caypullisaurus* specimens		Fernández, 2007b
	Small orbit	*Caypullisaurus*		Bardet and Fernández, 2000
		Brachypterygius		McGowan, 1976
			P. hercynicus	This work
	Broad postorbital region	*Caypullisaurus*		Bardet and Fernández, 2000
		Brachypterygius		McGowan, 1976
		Athabascasaurus		Druckenmiller and Maxwell, 2010
	Strong dentition	*Undorosaurus*		Efimov, 1997
		Brachypterygius		McGowan, 1976
	External naris subdivided	New Ophthalmosauridae		Fischer et al., in review
	Septomaxilla well ossified	Never mentioned explicitly in any Ophthalmosauridae		
	Squamosal lost		*P. hercynicus*	This work
	Semi-hemispherical occipital condyle		Many *P. "campylodon"* specimens	Pers. obs.
	Extracondylar area extremely reduced	All advanced Ophthalmosauridae		e.g. Maxwell, 2010
	Atlas-axis co-ossified with third cervical centrum		*P. americanus*	Maxwell and Kear, 2010
			P. australis	Maxwell and Kear, 2010
	Intercentra not differentiated	Meaning unclear		
	Humerus with very strong trochanter dorsalis	New Ophthalmosauridae		Fischer et al., in review
			P. campylodon	Kiprijanoff, 1881
	Two or three distal facets	2: *Nannopterygius*		Hulke, 1871; Kirton, 1983
		2: New Ophthalmosauridae		Fischer et al., in review
		3: all other Ophthalmosauridae		
			3-4: *P. australis*	Wade, 1984; Zammit et al., 2010
			4: *P.* sp.	Maxwell and Caldwell, 2006b
			4: *P. hercynicus*	Kolb and Sander, 2009
	Anterior and posterior accessory digits well developed	Most Ophthalmosauridae		e.g. Motani, 1999
	Closely fitting, block-like phalanges	*Caypullisaurus*		Fernández, 1997
		Maiaspondylus		Maxwell and Caldwell, 2006a
		New Ophthalmosauridae		Fischer et al., in review
	Reduced pelvis and hindfins	Most Ophthalmosauridae		e.g. Maisch and Matzke, 2000

McGowan and Motani, 2003	Oblique radial facet		*P. hercynicus* *P. australis*	Kolb and Sander, 2009 Wade, 1984
	More than 1 postaxial digit	*Caypullisaurus* *Aegirosaurus* *Maiaspondylus*	 *P. platydactylus* *P. hercynicus*	Fernández, 1997 Bardet and Fernández, 2000 Maxwell and Caldwell, 2006a Broili, 1907 Kolb and Sander, 2009
	Crescentic pre- and postaxial elements		*Platypterygius* sp.	Fischer, unpub. data
	More than 25 elements in the longest digit	Only found in *P. australis* and possibly *P. hercynicus*		Wade, 1984; Kolb and Sander, 2009; Zammit et al., 2010
	Numerous, robust teeth well anchored in dental grooves	*Brachypterygius* *Aegirosaurus*		McGowan, 1976 Bardet and Fernández, 2000; Fischer et al., 2011
	Orbital ratio < 0.20	*Brachypterygius* *Aegirosaurus* *Caypullisaurus*		McGowan, 1976 Bardet and Fernández, 2000 Bardet and Fernández, 2000
	Snout ratio > 0.66	*Brachypterygius* *Aegirosaurus* *Caypullisaurus*	 *P. platydactylus* *P. hercynicus*	McGowan, 1976 Bardet and Fernández, 2000 Bardet and Fernández, 2000 Broili, 1907 Kolb and Sander, 2009
	Flat, oblique anterior surface of the basioccipital	Variable amongst Ophthalmosauridae		Pers. obs.
Maxwell and Caldwell, 2006b	Four bone-wide epipodium	*Khudiakovia* *Plutoniosaurus* *Caypullisaurus*	 3: *P. ochevi* 3: *P. americanus?*	Arkhangelsky, 1999 Efimov, 1997 Fernández, 2001 Arkhangelsky et al., 2008 Maxwell and Kear, 2010
	Extreme hyperphalangy	*Caypullisaurus*		Fernández, 2001
	Forefin eight or more digits wide		*P. hercynicus* (8 with additional internal digit)	Kolb and Sander, 2009
Kear and Barrett, 2007	Coarsely striated conical tooth crowns	*Brachypterygius* *Aegirosaurus*	 *P. americanus*	 Fischer et al., 2011 Nace, 1941
Kolb and Sander 2009	Internasal foramen present	Many Neoichthyosauria		Maisch and Matzke, 2000
	No basioccipital peg	Most Ophthalmosauridae		e.g. Maxwell, 2010
	Height/length dorsal vertebrae >2 in all dorsals	New Ophthalmosauridae *Ophthalmosaurus*		Fischer et al., in review Massare et al., 2006
	Height cervical centra/neural arc < 1	New Ophthalmosauridae Probably other Ophthalmosauridae		Fischer et al., in review
	Triangular posterior dorsal vertebrae		*P. americanus?* *P. campylodon*	Maxwell and Kear, 2010 Kiprijanoff, 1881
	Humerus with constricted shaft	Most Ophthalmosauridae		e.g. Motani, 1999
	Humerus with poorly expanded distal end	Ophthalmosauridae without extensive pre- and/or postaxial facets		
	Radius smaller than ulna	*Ophthalmosaurus* *Aegirosaurus* *Khudiakovia*	 *P. australis*	e.g. Kirton, 1983 Bardet and Fernández, 2000 Arkhangelsky, 1999 Wade, 1990

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