**List of taxa, geological time, and references in Zhu et al. (2022)**

*Acanthodes bronni*, Sakmarian to Asselian (BrazeauM and Valerie, 2015; Coates, 1994; Davis et al., 2012; Gross, 1935; Miles, 1973a; b; Watson, 1937)

*Aceraspis robustus*, upper Wenlock to upper Ludlow (Ritchie, 1967; Turner and Turner, 1974)

*Achoania jarvikii*, upper Lochkovian (Zhu and Yu, 2004; 2009; Zhu et al., 2001)

*Acronemus tuberculatus*, Anisian to Ladinian (Maisey, 2011)

*Akmonistion zangerli*, Serpukhovian (Coates and Sequeira, 1998; 2001; Coates et al., 1998)

*Andreolepis hedei*,Ludlow and Pridoli (Chen et al., 2016a)

*Anglaspis maccoulloughi*, Pridoli and Lochkovian (Randle and Sansom, 2016)

*Arabosteus variabilis*, Pragian to lower Emsian (Olive et al., 2011; 2014)

*Asterolepis ornate*, upper Givetian (Lukševičs, 2001; Upeniece, 2001; Vaskaninova, 2009)

*Austroptyctodus gardineri*, lower Frasnian (Long, 1997)

*Bannhuanaspis vukhuci*, upper Lochkovian to lower Pragian (Janvier et al., 1993)

*Benneviaspis holtedahli*,Lochkovian (Janvier, 1985; Ørvig, 1957)

*Boreaspis macrorhynchus*,Pragian (Janvier, 1985)

*Bothriolepis* spp., Givetian to Famennian (Long and Trinajstic, 2010)

*Brachyacanthus scutiger*, Lockhovian (Watson, 1937)

*Brindabellaspis stensioi*, lower Emsian to lower Eifelian (Young, 1980)

*Brochoadmones milesi*, Lockhovian (Hanke and Wilson, 2006)

*Buchanosteus confertituberculatus*, Emsian (Burrow and Turner, 1998; Long et al., 2014)

*Campbellodus decipiens*, lower Frasnian (Long, 1997)

*Cassidiceps vermiculatus*, Lockhovian (Gagnier and Wilson, 1996)

*Cephalaspis lyelli*, Lochkovian (Stensiö, 1932; White, 1958)

*Cheirolepis trailli*, upper Eifelian (Giles et al., 2015a; Pearson and Westoll, 1979)

*Cheirolepis canadensis*, lower Frasnian (Arratia and Cloutier, 1996; Pearson and Westoll, 1979)

*Cheiracanthus* spp.*,* Eifelian to Givetian (Burrow et al., 2020)

Chimaeroidei, Serpukhovian to present (Didier, 1995)

*Chondrenchelys problematica*, Visean (Finarelli and Coates, 2011; 2014; Moy-Thomas, 1935)

*Chuchinolepis dongmoensis*, lower Pragian (Tông-Dzuy and Janvier, 1990)

*Cladodoides wildungensis*, upper Famennian (Maisey, 2005)

*Cladoselache kepleri*, upper Famennian (Bendix-Almgreen, 1975; Maisey, 2007; Schaeffer, 1981)

*Climatius reticulatus*, Lochkovian (Miles, 1973a; Watson, 1937)

*Cobelodus aculeatus*, Sakmarian (Ivanov, 2005)

*Coccosteus cuspidatus*, Eifelian to Givetain (Miles and Westoll, 1968)

*Compagopiscis croucheri*,lower Frasnian (Gardiner and Miles, 1994)

*Cowralepis mclachlani*, upper Givetian or lower Frasnian (Ritchie, 2005)

*Culmacanthus stewarti*, Frasnian (Long, 1983)

*Damocles serratus*, Serpukhovian (Lund, 1986; Lund and Grogan, 1997)

*Dartmuthia gemmifera*, lower Ludlow (Gross, 1968; Märss et al., 2015)

*Debeerius ellefseni*, Bashkirian (Grogan and Lund, 2000)

*Diabolepis speratus*, upper Lochkovian (Chang, 1995; Chang and Yu, 1984)

*Diandongpetalichthys liaojiaoshanensis*, lower Lochkovian (Zhu, 1991)

*Dialipina salgueiroensis*,Emsian (Schultze, 1968; Schultze and Cumbaa, 2001)

*Dicksonosteus arcticus*, Lochkovian (Goujet, 1975; Goujet, 1984)

*Diplacanthus striatus*, lower Givetian (Miles, 1973a; Watson, 1937)

*Diplocercides* spp.*,* Givetian to Famennian (Forey, 1998)

*Diplodoselache woodi*, Visean (Dick, 1981)

*Dipterus* spp.*,* Eifelian to Givetian (Ahlberg and Trewin, 1995; White, 1965)

*Doliodus problematicus*, lower Emsian (Maisey et al., 2009; Miller et al., 2003)

*Dwykaselachus oosthuizeni*, Kungurian (Coates et al., 2017)

*Eastmanosteus calliaspis*, lower Frasnian (Dennis-Bryan, 1987)

*Egertonodus basanus*, Aptian (Teng et al., 2019)

*Ellopetalichthys scheii*, upper Givetian (Castiello, 2018)

*Entelognathus primordialis*, Ludfordian (Zhu et al., 2013)

*Epipetalichthys wildungensis*, upper Frasnian (Ørvig, 1957; Sallan and Coates, 2010)

*Escuminaspis laticeps*, lower Frasnian (Janvier et al., 2004)

*Eugaleaspis changi*, lower Lochkovian (Liu, 1965; Zhu and Gai, 2007)

*Eurycaraspis incilis*, Givetian (Liu, 1991)

*Eusthenopteron foordi*, lower Frasnian (Jarvik, 1980a; b)

*Euthacanthus macnicoli*, Lochkovian (Miles, 1973a; Newman et al., 2014; Watson, 1937)

*Falcatus falcatus*, Serpukhovian (Lund, 1985)

*Gavinia syntrips*, Givetian (Long, 1999)

*Gavinaspis convergens*, upper Lochkovian (Dupret et al., 2009)

*Gemuendina stuertzi*, upper Pragian to lower Emsian (Gross, 1963)

*Gladbachus adentatus*, Givetian (Coates et al., 2018)

*Gladiobranchus probaton*, Lochkovian (Hanke and Davis, 2008)

*Glyptolepis groenlandica*, upper Eifelian to lower Givetian (Ahlberg, 1989; Jarvik, 1972)

*Gogonasus andrewsae*, lower Frasnian (Holland, 2013; 2014; Long, 1985; Long et al., 1997; 2006)

*Groenlandaspis antarcticus*, Givetian (Ritchie, 1975; Young, 1989)

*Guangxipetalichthys tiaomajianensis*, lower to middle Givetian (Ji and Pan, 1997)

*Guiyu oneiros*, Ludfordian (Qiao and Zhu, 2010; Zhu et al., 2009)

*Gyracanthides* spp*.*, Famennian (Warren et al., 2000)

*Halimacanthodes ahlbergi*, lower Frasnian (Burrow et al., 2012)

*Hamiltonichthys mapesi*, Gzhelian (Maisey, 1989)

*Hanyangaspis guodingshanensis*, middle Telychian (Zhu and Gai, 2007)

*Helodus simplex*, Moscovian (Moy-Thomas, 1936)

*Hemicyclaspis murchisoni*, Ludlow (Stensiö, 1932)

*Holonema westolli*, lower Frasnian (Bechard et al., 2014)

*Homalacanthus concinnus*, lower Frasnian (Russell, 1951)

*Homalodontus aplopagus,* Lower Triassic (Mutter et al., 2007; 2008)

*Howqualepis rostridens*, Givetian (Long, 1988)

*Incisoscutum ritchiei*, lower Frasnian (Dennis and Miles, 1981; Giles et al., 2013)

*Iniopera richardsoni*, Moscovian to Kasimovian (Zangerl and Case, 1973)

*Ischnacanthus gracilis*, Lochkovian (Miles, 1973a; Watson, 1937)

*Jagorina pandora*, upper Frasnian (Stensiö, 1969; Young, 1986)

*Janusiscus schultzei*, middle Lockhovian (Giles et al., 2015c)

*Kansasiella eatoni*, upper Pennsylvanian (Poplin, 1975)

*Kathemacanthus rosulentus*, Lochkovian (Gagnier and Wilson, 1996; Hanke and Wilson, 2010)

*Kawichthys moodiei*, Gzhelian (Pradel et al., 2011)

*Kenichthys campbelli*, upper Emsian (Chang and Zhu, 1993; Zhu and Ahlberg, 2004)

*Kentuckia deani*, upper Tournaisian or lower Visean (Giles and Friedman, 2014; Rayner, 1951)

*Kimaspis tienshanica*, Lochkavian (Mark-Kurik, 1973)

*Kolymaspis sibirica,* Lochkavian (Bystrow, 1956)

*Kosoraspis peckai*, upper Lochkovian (Denison, 1978; Gross, 1959)

*Kujdanowiaspis podolica*, upper Lockhovian to lower Pragian (Dupret, 2010)

*Latviacanthus ventspilsensis*, Pragian (Schultze and Zidek, 1982)

*Lawrenciella schaefferi*, upper Pennsylvanian (Hamel and Poplin, 2008)

*Ligulalepis toombsi*, Emsian (Basden and Young, 2001; Basden et al., 2000; Burrow, 1994; Schultze, 1968)

*Lophosteus superbus*, lower Ludlow (Burrow and Simpson, 1995; Pickett et al., 2000; Schultze and Märss, 2004)

*Lunaspis broili*, upper Pragian to lower Emsian (Gross, 1961)

*Lupopsyrus pygmaeus*, Lochkovian (Hanke and Davis, 2012)

*Macropetalichthys rapheidolabis*, Eifelian (Stensiö, 1925; 1963; 1969)

*Materpiscis attenboroughi*, lower Frasnian (Long et al., 2008; Trinajstic et al., 2012)

*Meemannia eos*, upper Lochkovian (Zhu et al., 2006; 2010)

*Mesacanthus mitchelli*, Lochkovian (Miles, 1973a; Watson, 1937)

*Microbrachius dicki*,middle Givetian (Hemmings, 1978; Long et al., 2015)

*Miguashaia bureaui*, lower Frasnian (Cloutier, 1996; Forey, 1998)

*Mimipiscis toombsi*, lower Frasnian (Gardiner, 1984; Gardiner and Bartram, 1977; Giles and Friedman, 2014)

*Minicrania lirouyii*,lower Lochkovian (Zhu and Janvier, 1996)

*Moythomasia durgaringa*, lower Frasnian (Gardiner, 1984)

*Mulgaspis evansorum*, lower Eifelian (Janvier and Clément, 2005; Ritchie, 2004)

*Nectaspis areolate*, Emsian (Janvier, 1981)

*Nerepisacanthus denisoni*, upper Pridoli (Burrow and Rudkin, 2014)

*Norselaspis glacialis*, lower Pragian (Janvier, 1981)

*Notopetalichthys hillsi*, Middle Devonian (Woodward, 1941; Young, 2004)

*Obtusacanthus corroconis*, Lochkovian (Hanke and Wilson, 2004)

*Onychodus jandemarrai*, lower Frasnian (Andrews et al., 2005)

*Onychoselache traquari*, middle Visean (Coates and Gess, 2007; Dick and Maisey, 1980)

*Osorioichthys marginis*, lower Famennian (Taverne, 1997)

*Osteolepis macrolepidotus*, lower Givetian (Jarvik, 1980a; b; Thomson, 1965; Westoll, 1936)

*Ozarcus mapesae*, Serpukhovian (Pradel et al., 2014)

*Pampetalichthys longhuaensis*, lower Emsian (Zhu, 2000; Zhu and Wang, 1996)

*Parabuchanosteus murrumbidgeensis*, Pragian to Emsian (White and Toombs, 1972; Young, 1979)

*Parayunnanolepis xitunensis*,Lochkovian (Zhang et al., 2001; Zhu et al., 2012)

*Paucicanthus vanelsti*, Lochkovian (Hanke, 2002)

*Pauropetalichthys magnoculus*, Emsian (Pan et al., 2015)

*Polybranchiaspis liaojiaoshanensis*, Lochkovian (Liu, 1965; 1975)

*Procephalaspis oeselensis*, Wenlock and Ludlow (Denison, 1951)

*Psarolepis romeri*, Lockhovian (Yu, 1998; Zhu and Yu, 2004; 2009; Zhu et al., 1999)

*Parexus recurvus*, Lochkovian (Burrow et al., 2013; Miles, 1973a; Watson, 1937)

*Poracanthodes menneri*, lower Lochkovian (Valiukevicius, 1992)

*Porolepis* spp., Pragian to Emsian (Clément, 2004; Jarvik, 1972)

*Powichthys thorsteinssoni*, Lochkovian to Pragian (Jessen, 1980)

*Promesacanthus eppleri*, Lochkovian (Hanke, 2008)

*Pterichthyodes milleri*, upper Eifelian (Hemmings, 1978)

*Ptomacanthus anglicus*, Lochkovian (Brazeau, 2012; Dineley, 1999)

*Ptyctolepis brachynotus*, Pragian, (Lu et al., 2017)

*Pucapampella rodrigae*, upper Eifelian to Givetian (Maisey and Anderson, 2001)

*Qilinyu rostrata*, Ludfordian (Zhu et al., 2016)

*Qingmenodus yui*, upper Pragian (Lu and Zhu, 2010; Lu et al., 2016)

*Quasipetalichthys haikouensis*, Givetian (Liu, 1991)

*Radotina kosorensis*, Lochkovian (Vaškaninová and Ahlberg, 2017)

*Radotina tesselata*, Pragian (Gross, 1958; Vaškaninová and Ahlberg, 2017)

*Ramirosuarezia boliviana*, Eifelian (Pradel et al., 2009)

*Raynerius splendens*, Frasnian (Giles et al., 2015b)

*Remigolepis* spp*.*,Famennian (Andrews, 1978)

*Rhadinacanthus longispinus*, Emsian (Burrow et al., 2000)

*Rhamphodopsis threiplandi*, lower Givetian (Long, 1997; Miles, 1967)

*Romundina stellina*, Lochkovian (Dupret et al., 2014; Ørvig, 1975)

*Shearsbyaspis oepiki*, Emsian (Castiello, 2018; Young, 1985)

***Shenacanthus vermiformis***, Telychian, this paper

*Shuyu zhejiangensis*, middle to upper Telychian (Gai et al., 2011)

*Sigaspis lepidophora*, lower Pragian (Goujet, 1973)

*Sinolepis macrocephala*, Famennian (Liu and P'an, 1958; Ritchie et al., 1992)

*Sinopetalichthys kueiyangensis*, lower to middle Emsian (Zhao and Zhu, 2010)

*Sparalepis tingi*, Ludfordian (Choo et al., 2017)

*Squalus* spp.*,* Pliocene to present (Gans and Parsons, 1964)

*Styloichthys changae*, upper Lochkovian (Friedman, 2007; Zhu and Yu, 2002)

*Sudaspis chlupaci*, Lochkovian (Vaškaninová and Ahlberg, 2017)

*Synechodus dubrisiensis,* Upper Jurassic to Upper Cretaceous (Maisey, 1985)

*Tamiobatis vetustus*, Famennian (Schaeffer, 1981; Williams, 1998)

*Tetanopsyrus lindoei/breviacanthias*, Lochkovian (Gagnier et al., 1999; Hanke et al., 2001)

*Tlamaspis inopinatus*, Lochkovian (Vaškaninová and Ahlberg, 2017)

*Tremataspis mammillata*, Gorstian (Denison, 1947; 1951; Robertson, 1937; Robertson, 1938)

*Tribodus limae,* Albian (Lane, 2010; Lane and Maisey, 2009; 2012; Maisey and Denton, 2016)

*Triodus moorei,* Bashkirian to Changhsingian (Heidtke et al., 2004; Soler-Gijon and Hampe, 1998)

*Tristychius arcuatus*, lower Serpukhovian (Coates and Gess, 2007; Dick, 1978)

*Uraniacanthus curtus*, Lochkovian (Newman et al., 2012)

*Uranolophus wyomingensis*, Pragian (Denison, 1968)

*Vernicomacanthus waynensis*, Lochkovian (Miles, 1973a)

*Waengsjoeaspis excellens*, Lochkovian (Janvier, 1985)

*Wenshanaspis zhichangensis*, Pragian (Zhao et al., 2002)

*Widjeaspis warrooensis*, Middle Devonian (Barker and Bone, 1995; Basden, 1999)

*Wuttagoonaspis fletcheri*, Emsian to Eifelian (Ritchie, 1973)

***Xiushanosteus mirabilis****,* Telychian, this paper

*Youngolepis praecursor*, upper Lochkovian (Chang, 1982; 1991; Chang and Yu, 1981)

*Yunnanolepis* spp., Lochkovian (Zhang, 1980; Zhu, 1996)

*Zenaspis salweyi*, Lochkovian (Stensiö, 1932)

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