Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Group	Pred/ Prey	Ecology	Range or appearances	Source(s)	Range (pbdb)	Notes (diversity)	Notes (Ecology)
SHELL-CRUSHING PREDATORS							
Belemnites	Pred	Shell-Crusher	Paleozoic - present	Walker and Brett (2002)	Paleozoic - present	Become diverse and abundant in Jurassic	
Stomatopods	Pred	Shell-Breaker	Devonian - present	Walker and Brett (2002)	Carboniferous - present	Very few pbdb references, diversity is unclear	Use raptorial thoracopods to smash or spear prey, known from Carboniferous. Listed as omnivore on PBDB, but they are obligate carnivores if they have folding thoracopods
Brachyuran Crabs	Pred	Shell-Breaker	Triassic - present	Paleobiology II (p94), Harper (2006), Walker & Brett (2002), Forster (1985)	Norian - present	Single Triassic occurrence is non-marine, appear to diversify in the Cretaceous. No Early Jurassic occurences on PBDB, but the Triassic occurrence is with many specimens	

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Pycnodontiform Fish	Pred	Shell-Crusher	Late Triassic - Eocene	Lombardo & Tintori (2005), Vermeij (1987), Paleobiology II, Harper (1991), Tintori (1991)	Norian - Pleistocene	Appear consistently in Late Triassic and Norian, also radiate in the Norian, further diversify in Cretaceous	Shell-crushing dentition
Palinuran Lobsters	Pred	Shell-Breaker	Mid-Triassic - recent	Vermeij (1987), Garassino et al (1996), Walker & Brett (2002), Forster (1985)	Jurassic - Eocene	One occurence in Carnian (pbdb),	
Teleosts Fish	Pred	Shell-crusher	Early Triassic (primitive) - present	Harper (2006), Vermeij (2008)	Nor - present	Single Carnian and Norian occurences (pbdb), several Early Triassic occurences of primitives	Variety of feeding strategies
Macrosemiid Fish	Pred	Shell-Crusher	Late Triassic - Cretaceous	Tintori (1991), Lombardo & Tintori (2005)	Norian - Cretaceous	Few occurences on PBDB, and none in the Jurassic, radiated in the Norian	Possibly a small crustacean-eater, and shell-crushing dentition

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Holostean Fish	Pred	Shell-Crusher	Late Triassic	(Tintori 1998), Walker & Brett (2002)	Early Triassic - present	Appear in Early Triassic but radiate in the Norian	"Sub-holostean" Possibly an Ammonoid-eater
Homaridian Lobsters	Pred	Shell-Breaker	Earliest Jurassic - present	Paleobiology II (p94), Harper (1991)	Cretaceous-present	No pre-Cretaceous pbdb occurences, but there are in the literature	
Macrura	Pred	Shell-Breaker	Norian	Garassino	Ladinian - Callovian	Single Smithian occurrence	
Nautiloids	Pred	Shell-Crusher	Paleozoic - present	Walker and Brett (2002)	Permian - present	Diversify in the Jurassic	
Semionotiform Fish	Pred	Shell-Crusher	Induan - Campanian	Tintori (1991), Lombardo & Tintori (2005), Vermeij (1987)	Triassic to Cretaceous	Become abundant and diverse in the Late Triassic	Many strictly durophaous; Shell-crushing dentition
Placodonts	Pred	Shell-Crusher	Triassic only	Tintori (1998), Harper (2006)	Anisian - Rhaetian	Always Rare (Tintori); Abundant (Harper)	Sluggish, shell-eaters

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Neoselachian Sharks	Pred	Shell-Crusher	Permian - present	Maisey et al (2004), Walker and Brett (2002), Underwood (2006)	Carboniferous - Pleistocene	Present in low abundance and diversity until the Norian (pbdb) where they increased in abundance (Underwood), further diversifications in Cretaceous	
Hybodontid Sharks	Pred	Shell-Crusher	Permian - Cretaceous	Paleobiology II (p94), Tintori (1998), Brett (2002)	Permian - Danian	Family Lonchidiidae, Very low diversity and abundance until the Mid to Late Triassic	Shell-crushing dentition
Ammonoids	Pred	Shell-Crusher	Paleozoic - End-Cretaceous	Harper (2006), Walker & Brett (2002), Paleobiology II (p94)	Paleozoic to End-Cretaceous	Very diverse and abundance in Permian, great extinction at P/T, new diversity in Triassic	Shell-crushing groups
# Families Crushing Crustaceans	Pred			Harper (2003)			

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

PREY WITH ANTI-PREDATOR STRATEGIES FOR SHELL-CRUSHING							
Cementing Barnacles	Prey	Protected	Late Jurassic - Tertiary	Walker & Brett (2002)		Possible presence in Carboniferous - Late Jurassic	
Boring Clionids	Prey	Hidden	Early Jurassic - Tertiary	Walker & Brett (2002)	Eocene	Very few pbdb records; Possible presence in Carboniferous - Early Jurassic	
Burrowing Spatangoids	Prey	Escape	Late Triassic - Tertiary	Walker & Brett (2002)		Diversify in mid-Jurassic	
Cementing Annelids	Prey	Protected	Early Ordovician - Tertiary	Walker & Brett (2002)		Diversify in Late Triassic	
Boring Annelids	Prey	Hidden	Early Ordovician - Tertiary	Walker & Brett (2002)		Diversify in Late Triassic	
Burrowing Bivalves	Prey	Escape	Cambrian - Tertiary	Walker & Brett (2002)		Diversify in Late Triassic	

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Obliquely-ribbed bivalves	Prey	Protected/Escaped	Paleocoic to present	Checa (2003)		Appear in Paleozoic, diversify in Late Triassic, and decline in Late Cretaceous	Ribs reinforce shells and may facilitate burrowing
Cementing Brachiopods	Prey	Protected	Ordovician - Mid Triassic	Walker & Brett (2002)		Diversfy in mid-Ordovician, possible presence Late Permian to Early Jurassic	
Clades of Cementing Bivalves	List		appearance		appearance (pbdb)		
Pseudomonotidae	Prey	Cementer/Protected	Permian	Harper (1991)	Permian	Three isolated occurences in Carboniferous (pbdb)	
Gryphaeidae	Prey	Cementer/Protected	Norian	Harper (1991)	Carnian	Two occurences in Ladinian. Low Diversity until Norian	Juvenile cementer, adult unattached recliner

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Ostreidae	Prey	Cementer/Protected	Norian	Harper (1991)	Latest Permian	Lopha in Permian - a problemmatic taxa. Low diversity until late Triassic	
Plicatulidae	Prey	Cementer/Protected	Norian	Harper (1991)	Anisian	Appears monospecific in Anisian, diversifies in Norian	
Terquemiidae	Prey	Cementer/Protected	Norian	Harper (1991)	Anisian	Only diverse in Anisian China,very rare in Ladinian, but present consistently Late Triassic, though not especially diverse	
Dimyidae	Prey	Cementer/Protected	Rhaetian	Harper (1991)	Carnian	**No Rhaetian occurences**	
Atreya	Prey	Cementer/Protected	Rhaetian	Harper (1991)	Rhaetian	Minor Norian occurences	
Lithiotidae	Prey	Cementer/Protected	Sinemurian	Harper (1991)	Bajonian	Only one occurrence on PBDB	
Spondylidae	Prey	Cementer/Protected	Aalenian	Harper (1991)	Bajonian	Single occurrence in Hettangian	

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Eopecten	Prey	Cementer/Protected	Bajonian	Harper (1991)	Late Triassic	Low diversity in general, but becomes common in mid-Jurassic	
Rudists	Prey	Cementer/Protected	Kimmeridgian	Harper (1991)	Cenomanian	Lots of Ceno occurences, no Jurassic occurences in pbdb	
Prohinnites	Prey	Cementer/Protected	Aptian	Harper (1991)	Hauterivian	Not common at any time	
Chondrodontidae	Prey	Cementer/Protected	Cenomanian	Harper (1991)	Aptian	Single non-species occurrence in Hauterivian	
Chamiidae	Prey	Cementer/Protected	Campanian	Harper (1991)	Barremian	More occurrences in latest Cretaceous, but diversifies post-Cretaceous	

SHELL-CRUSHING TRACE FOSSILS

Repair Crushes	Prey	Unsuccessful breakage	Late Cretaceous	Walker & Brett (2002), Vermeij et al (1982)	N/A	more common in Paleozoic, then a disappearance in Triassic and Jurassic	Ineffectual predation (Tintori 1998)
DRILLING PREDATORS							
Cymatiidae Gastropods	Pred	Driller	Cretaceous - present	Walker & Brett (2002), Sohl (1969)	Paleocene - Pleistocene	Don't radiate until post-Cretaceous	
Cassidae	Pred	Driller	Late Cretaceous - present	Walker & Brett (2002)	Late Cretaceous - present	Not common until post-Cretaceous	
Muricid Gastropods	Pred	Driller	Early Cretaceous - present	Harper (2006), Walker & Brett (2002), Sohl (1969)	Cretaceous - present	First appears in Cretaceous	
Naticid Gastropods	Pred	Driller	Early Cretaceous - present	Vermeij (1987), Harper (2006), Walker & Brett (2002), Sohl (1969)	Triassic (moon snails) - present	Relatively common elements in Jurassic	Triassic Naticidae were bulldozers (Moon Snails), possibly not drillers (Sohl); Drilling range begins in Cretaceous

Supplementary Data 3 - Notes on Ranges and Ecologies of Major Predator Taxa

Octopods	Pred	Driller	Carboniferous - Tertiary	Harper (2006)	Jurassic - Miocene	Scanty fossils from the Carboniferous, first fossils in Jurassic (pbdb), possible presence in Triassic	Rapid drillers, only drill larger prey
PREY WITH ANTI-PREDATOR STRATEGIES FOR DRILLING							
Spiny Echinoids	Prey	Protected	Silurian - Early Triassic	Walker & Brett (2002)		Diverse in mid-Cretaceous	
Spiny Gastropods	Prey	Protected	Devonian - Tertiary	Walker & Brett (2002)		Diversify in Mid-Cretaceous, possible presence in Silurian	
Spiny Bivalves	Prey	Protected	Carboniferous - Tertiary	Walker & Brett (2002)		Never very diverse	
Spiny Crinoids	Prey	Protected	Silurian - Early Triassic	Walker & Brett (2002)		Diverse in Silurian to Pennsylvanian, possible presence in Permian	

Spiny Brachiopods	Prey	Protected	Devonian - Late Permian	Walker & Brett (2002)		Diverse in Carboniferous to Permian, possible presence in Silurian, Triassic, and Early Jurassic	
DRILLING TRACE FOSSILS							
Drillholes	Prey		Paleozoic, Late Triassic, Early Juassic, Cretaceous	Harper (2003) summary,			

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