Supplemental File 3: MCMCtree timetrees

The soft explosive model of placental mammal evolution

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Contents

MCMCtree timetrees

Trees can be opened in Figtree, and include mean and 95% credible intervals.

122-taxon dR32 trees

These analyses show that retaining the calibration scheme from Phillips [1], but deleting large, long-lived taxa does not increase the age estimates for the placental interordinal diversification, contrary to the claim of Springer *et al.* [2]. The soft explosive model is supported.

A. Autocorrelated rates

((((((((((Didelphis: 0.225793, Monodelphis: 0.225793) '0.199-0.272': 0.059274, Glironia: 0.285068) '0.258-0.328': 0.018402, Caluromys: 0.303469) '0.275-0.351': 0.368758, (Dromiciops: 0.585299, ((Notoryctes: 0.565264, (((Isoodon: 0.104434, Echymipera: 0.104434) '0.086-0.123': 0.154303, Macrotis: 0.258737) '0.232-0.289': 0.293074, (Dasyurus: 0.272207, Myrmecobius: 0.272207) '0.241-0.310': 0.279605) '0.528-0.581': 0.013453) '0.541-0.592': 0.004328, ((((Acrobates: 0.392512, ((Petaurus: 0.327201, Pseudochirops: 0.327201) '0.306-0.349': 0.024607, Tarsipes: 0.351808) '0.330-0.373': 0.040704) '0.371-0.414': 0.046153, ((Macropus: 0.162976, Aepyprymnus: 0.162976) '0.145-0.182': 0.104771, Hypsiprymnodon: 0.267747) '0.249-0.290': 0.170918) '0.415-0.459': 0.011181, (Cercartetus: 0.420263, Trichosurus: 0.420263) '0.394-0.445': 0.029583) '0.426-0.471': 0.046567, Phascolarctos: 0.496413) '0.468-0.522': 0.073179) '0.546-0.596': 0.015706) '0.560-0.613': 0.086929) '0.650-0.704': 0.049083, (Caenolestes: 0.090828, Rhyncholestes: 0.090828) '0.070-0.120': 0.630483) '0.689-0.758': 0.961479, (((((Echinops: 0.545452, (Amblysomus: 0.084993, Chrysochloris: 0.084993) '0.064-0.108': 0.460459) '0.521-0.577': 0.041587, (Elephantulus: 0.398108, Rhynchocyon: 0.398108) '0.358-0.441': 0.188931) '0.568-0.615': 0.017973, (Heterohyrax: 0.030911, Procavia: 0.030911) '0.023-0.041': 0.574102) '0.585-0.632': 0.154675, (Dasypus: 0.523851, ((Choloepus: 0.165220, Bradypus: 0.165220) '0.122-0.204': 0.287068, Cyclopes: 0.452288) '0.424-0.478': 0.071564) '0.495-0.552': 0.235837) '0.741-0.778': 0.006181, ((((Tragulus: 0.648857, (((((Prionodon: 0.248357, Felis: 0.248357) '0.227-0.267': 0.028758, ((Fossa: 0.166411, Suricata: 0.166411) '0.143-0.186': 0.100775, Genetta: 0.267186) '0.247-0.286': 0.009929) '0.256-0.295': 0.058024, Nandinia: 0.335138) '0.312-0.356': 0.106053, ((Ailurus: 0.248037, Procyon: 0.248037) '0.224-0.269': 0.012809, Mephitis: 0.260846) '0.237-0.282': 0.180345) '0.413-0.463': 0.197781, (Manis_pentadactyla: 0.172333, Manis_tricuspis: 0.172333) '0.134-0.214': 0.466639) '0.622-0.654': 0.009885) '0.633-0.663': 0.001570, (((((Craseonycteris: 0.392676, Megaderma: 0.392676) '0.367-0.416': 0.049823, Rhinopoma: 0.442499) '0.424-0.460': 0.015647, (Hipposideros: 0.365292, Rhinolophus: 0.365292) '0.342-0.388': 0.092854) '0.440-0.476': 0.060514, Nyctimene: 0.518660) '0.502-0.534': 0.020605, (((((Miniopterus: 0.380532, Myotis: 0.380532) '0.361-0.402': 0.025317, Tadarida: 0.405849) '0.389-0.424': 0.015177, Natalus: 0.421026) '0.405-0.439': 0.019684, Myzopoda: 0.440710) '0.425-0.458': 0.014252, ((Emballonuridae: 0.417772, Nycteris: 0.417772) '0.399-0.438': 0.035467, ((((Furipterus: 0.324173, Noctilio: 0.324173) '0.300-0.346': 0.037826, (Pteronotus: 0.320829, Artibeus: 0.320829) '0.298-0.343': 0.041170) '0.343-0.380': 0.005878, Thyroptera: 0.367878) '0.349-0.386': 0.028195, Mystacina: 0.396072) '0.379-0.413': 0.057166) '0.438-0.469': 0.001723) '0.440-0.471': 0.084303) '0.523-0.554': 0.111161) '0.634-0.665': 0.012790, ((((Erinaceus: 0.273810, Podogymnura: 0.273810) '0.246-0.306': 0.298336, Sorex: 0.572145) '0.552-0.592': 0.034081, Talpa: 0.606226) '0.588-0.622': 0.006378, Solenodon: 0.612604) '0.595-0.628': 0.050611) '0.648-0.677': 0.057303, ((((Cynocephalus: 0.054391, Galeopterus: 0.054391) '0.041-0.070': 0.605614, ((Callithrix: 0.585459, Tarsius: 0.585459) '0.571-0.598': 0.029898, ((((Microcebus: 0.254200, Propithecus: 0.254200) '0.234-0.272': 0.007886, Lemur: 0.262086) '0.242-0.281': 0.171969, Daubentonia: 0.434054) '0.416-0.451': 0.029292, (Otolemur: 0.187138, Nycticebus: 0.187138) '0.163-0.213': 0.276208) '0.447-0.480': 0.152011) '0.605-0.623': 0.044647) '0.648-0.671': 0.002654, (Ptilocercus: 0.446629, Tupaia: 0.446629) '0.413-0.476': 0.216030) '0.651-0.674': 0.002680, ((Leporidae: 0.382694, Ochotona: 0.382694) '0.344-0.419': 0.261234, (((((((Abrocoma: 0.177686,

((Capromys: 0.119218, (Myocastor: 0.090269, Hoplomys: 0.090269) '0.081-0.099': 0.028949) '0.109-0.129': 0.046303, (Ctenomys: 0.144720, Octodontomys: 0.144720) '0.133-0.157': 0.020802) '0.155-0.177': 0.012165) '0.166-0.190': 0.088020, (Chinchilla: 0.204700, Dinomys: 0.204700) '0.189-0.221': 0.061006) '0.253-0.279': 0.021779, ((Agouti: 0.206020, (Cavia: 0.197809, Dasyprocta: 0.197809) '0.185-0.211': 0.008211) '0.193-0.219': 0.075017, Erethizon: 0.281037) '0.268-0.295': 0.006448) '0.274-0.301': 0.057042, (Heterocephalus: 0.310327, (Petromus: 0.176477, Thryonomys: 0.176477) '0.159-0.195': 0.133850) '0.296-0.325': 0.034200) '0.330-0.359': 0.018782, Hystrix: 0.363309) '0.348-0.378': 0.141652, (Ctenodactylus: 0.350542, Laonastes: 0.350542) '0.325-0.375': 0.154419) '0.488-0.520': 0.073922, (((Anomalurus: 0.458609, Pedetes: 0.458609) '0.438-0.479': 0.085860, (((((Cricetus: 0.197007, Mus: 0.197007) '0.180-0.215': 0.017095, Petromyscus: 0.214102) '0.198-0.231': 0.010969, Calomyscidae: 0.225070) '0.205-0.247': 0.144544, Spalax: 0.369615) '0.353-0.386': 0.083935, Jaculus: 0.453550) '0.438-0.469': 0.090919) '0.531-0.555': 0.006950, (Geomyidae: 0.247361, Dipodomys: 0.247361) '0.212-0.276': 0.304058) '0.538-0.562': 0.027465) '0.565-0.589': 0.003386, ((Aplodontia: 0.430150, Sciuridae: 0.430150) '0.402-0.454': 0.111727, Gliridae: 0.541877) '0.528-0.555': 0.040393) '0.569-0.593': 0.061659) '0.630-0.656': 0.021410) '0.653-0.676': 0.055180) '0.706-0.734': 0.045351) '0.748-0.782': 0.916921) '1.628-1.724': 0.229552, (Ornithorhynchus: 0.306211, Tachyglossus: 0.306211) '0.185-0.455': 1.606131) '1.875-1.950': 1.216086, ((Gallus: 0.748558, Taeniopygia: 0.748558) '0.656-0.865': 1.960218, Anolis: 2.708776) '2.561-2.865': 0.419653) '3.083-3.186': 0.598344, Xenopus: 3.726773) '3.606-3.796': 0.476286, Danio: 4.203058) '4.159-4.253': 0.013211;

B. Independent rates

((((((((((Didelphis: 0.155450, Monodelphis: 0.155450) '0.135-0.178': 0.038292, Glironia: 0.193741) '0.173-0.217': 0.013662, Caluromys: 0.207404) '0.186-0.231': 0.316061, (Dromiciops: 0.425764, ((Notoryctes: 0.408119, (((Isoodon: 0.081613, Echymipera: 0.081613) '0.069-0.096': 0.095572, Macrotis: 0.177185) '0.158-0.199': 0.221825, (Dasyurus: 0.192911, Myrmecobius: 0.192911) '0.168-0.220': 0.206098) '0.377-0.422': 0.009109) '0.387-0.432': 0.003552, ((((Acrobates: 0.267897, ((Petaurus: 0.226876, Pseudochirops: 0.226876) '0.207-0.248': 0.018267, Tarsipes: 0.245143) '0.226-0.266': 0.022754) '0.249-0.289': 0.032031, ((Macropus: 0.115234, Aepyprymnus: 0.115234) '0.101-0.131': 0.072930, Hypsiprymnodon: 0.188165) '0.171-0.208': 0.111763) '0.281-0.321': 0.007415, (Cercartetus: 0.285693, Trichosurus: 0.285693) '0.264-0.310': 0.021649) '0.288-0.329': 0.032620, Phascolarctos: 0.339963) '0.320-0.363': 0.071708) '0.391-0.434': 0.014094) '0.405-0.449': 0.097700) '0.493-0.552': 0.034257, (Caenolestes: 0.070224, Rhyncholestes: 0.070224) '0.058-0.084': 0.487498) '0.525-0.592': 1.013111, (((((Echinops: 0.552108, (Amblysomus: 0.075246, Chrysochloris: 0.075246) '0.062-0.089': 0.476862) '0.525-0.585': 0.046310, (Elephantulus: 0.420020, Rhynchocyon: 0.420020) '0.389-0.455': 0.178398) '0.578-0.628': 0.020004, (Heterohyrax: 0.030280, Procavia: 0.030280) '0.024-0.037': 0.588142) '0.595-0.647': 0.132019, (Dasypus: 0.439728, ((Choloepus: 0.128063, Bradypus: 0.128063) '0.108-0.152': 0.252178, Cyclopes: 0.380241) '0.348-0.419': 0.059487) '0.413-0.480': 0.310713) '0.729-0.774': 0.005950, ((((Tragulus: 0.629806, (((((Prionodon: 0.160519, Felis: 0.160519) '0.143-0.179': 0.027340, ((Fossa: 0.119131, Suricata: 0.119131) '0.103-0.136': 0.061884, Genetta: 0.181015) '0.164-0.199': 0.006844) '0.172-0.205': 0.034617, Nandinia: 0.222476) '0.204-0.243': 0.152186, ((Ailurus: 0.201834, Procyon: 0.201834) '0.175-0.228': 0.010832, Mephitis: 0.212665) '0.186-0.239': 0.161996) '0.339-0.404': 0.239878, (Manis_pentadactyla: 0.151845, Manis_tricuspis: 0.151845) '0.124-0.185': 0.462694) '0.592-0.637': 0.015266) '0.610-0.650': 0.001321, (((((Craseonycteris: 0.353852, Megaderma: 0.353852) '0.322-0.385': 0.029835, Rhinopoma: 0.383686) '0.354-0.412': 0.016041, (Hipposideros: 0.280733, Rhinolophus: 0.280733) '0.243-0.315': 0.118994) '0.370-0.426': 0.048357, Nyctimene: 0.448084) '0.421-0.476': 0.031233, (((((Miniopterus: 0.339740, Myotis: 0.339740) '0.312-0.364': 0.025603, Tadarida: 0.365343) '0.341-0.388': 0.011106, Natalus: 0.376449) '0.354-0.399': 0.021842, Myzopoda: 0.398291) '0.376-0.420': 0.009444, ((Emballonuridae: 0.372801, Nycteris: 0.372801) '0.348-0.397': 0.033293, ((((Furipterus: 0.297682, Noctilio: 0.297682) '0.271-0.322': 0.030421, (Pteronotus: 0.292646, Artibeus: 0.292646) '0.267-0.315': 0.035457) '0.305-0.349': 0.004864, Thyroptera: 0.332967) '0.310-0.354': 0.021929, Mystacina: 0.354896) '0.331-0.376': 0.051198) '0.384-0.427': 0.001641) '0.386-0.428': 0.071581) '0.453-0.504': 0.151810) '0.611-0.651': 0.015012, ((((Erinaceus: 0.317130, Podogymnura: 0.317130) '0.284-0.352': 0.239094, Sorex: 0.556223) '0.535-0.577': 0.032994, Talpa: 0.589217) '0.567-0.607': 0.005501, Solenodon: 0.594718) '0.573-0.613': 0.051420) '0.627-0.665': 0.063062, ((((Cynocephalus: 0.051007, Galeopterus: 0.051007) '0.041-0.063': 0.603328, ((Callithrix: 0.571533, Tarsius: 0.571533) '0.547-0.593': 0.029987, ((((Microcebus: 0.169422, Propithecus: 0.169422) '0.147-0.194': 0.008385, Lemur: 0.177807) '0.155-0.202': 0.165274, Daubentonia: 0.343081) '0.307-0.387': 0.031036, (Otolemur: 0.144093, Nycticebus: 0.144093) '0.122-0.171': 0.230025) '0.339-0.417': 0.227403) '0.579-0.617': 0.052814) '0.639-0.670': 0.003367, (Ptilocercus: 0.427008, Tupaia: 0.427008) '0.390-0.473': 0.230694) '0.643-0.673':

0.003428, ((Leporidae: 0.397298, Ochotona: 0.397298) '0.359-0.432': 0.245265, (((((((Abrocoma: 0.226594, ((Capromys: 0.155130, (Myocastor: 0.121917, Hoplomys: 0.121917) '0.107-0.137': 0.033213) '0.140-0.171': 0.059396, (Ctenomys: 0.178476, Octodontomys: 0.178476) '0.161-0.195': 0.036050) '0.199-0.230': 0.012069) '0.211-0.242': 0.096936, (Chinchilla: 0.226385, Dinomys: 0.226385) '0.199-0.254': 0.097145) '0.307-0.342': 0.021857, ((Agouti: 0.243825, (Cavia: 0.234417, Dasyprocta: 0.234417) '0.213-0.259': 0.009408) '0.222-0.269': 0.091529, Erethizon: 0.335354) '0.317-0.355': 0.010033) '0.329-0.364': 0.057056, (Heterocephalus: 0.358678, (Petromus: 0.229303, Thryonomys: 0.229303) '0.206-0.254': 0.129375) '0.339-0.379': 0.043765) '0.385-0.420': 0.016882, Hystrix: 0.419325) '0.402-0.437': 0.113958, (Ctenodactylus: 0.379758, Laonastes: 0.379758) '0.348-0.409': 0.153525) '0.519-0.548': 0.057851, (((Anomalurus: 0.430519, Pedetes: 0.430519) '0.400-0.462': 0.124886, (((((Cricetus: 0.248813, Mus: 0.248813) '0.225-0.273': 0.022995, Petromyscus: 0.271808) '0.248-0.296': 0.011399, Calomyscidae: 0.283207) '0.259-0.310': 0.122351, Spalax: 0.405558) '0.385-0.427': 0.080066, Jaculus: 0.485624) '0.468-0.505': 0.069782) '0.545-0.567': 0.007797, (Geomyidae: 0.285534, Dipodomys: 0.285534) '0.252-0.321': 0.277669) '0.554-0.574': 0.027931) '0.584-0.601': 0.003423, ((Aplodontia: 0.399454, Sciuridae: 0.399454) '0.362-0.431': 0.149951, Gliridae: 0.549405) '0.529-0.567': 0.045151) '0.587-0.605': 0.048007) '0.630-0.657': 0.018566) '0.648-0.676': 0.048071) '0.693-0.726': 0.047191) '0.736-0.778': 0.814442) '1.475-1.660': 0.307111, (Ornithorhynchus: 0.206921, Tachyglossus: 0.206921) '0.168-0.252': 1.671023) '1.802-1.925': 1.250546, ((Gallus: 0.691875, Taeniopygia: 0.691875) '0.648-0.771': 1.937236, Anolis: 2.629111) '2.544-2.774': 0.499379) '3.085-3.184': 0.605631, Xenopus: 3.734121) '3.621-3.800': 0.481131, Danio: 4.215252) '4.163-4.255': 0.013211;

122-taxon dR40 trees

These analyses add further calibration priors (see Supplemental file 2: Table S2, dR40). The soft explosive model is supported.

A. Autocorrelated rates

((((((((((Didelphis: 0.226067, Monodelphis: 0.226067) '0.196-0.267': 0.058928, Glironia: 0.284995) '0.253-0.325': 0.018607, Caluromys: 0.303602) '0.269-0.347': 0.362427, (Dromiciops: 0.578236, ((Notoryctes: 0.558093, (((Isoodon: 0.101690, Echymipera: 0.101690) '0.085-0.122': 0.152002, Macrotis: 0.253693) '0.219-0.293': 0.291240, (Dasyurus: 0.268908, Myrmecobius: 0.268908) '0.228-0.315': 0.276024) '0.509-0.583': 0.013161) '0.521-0.597': 0.004349, ((((Acrobates: 0.384668, ((Petaurus: 0.319008, Pseudochirops: 0.319008) '0.291-0.346': 0.025024, Tarsipes: 0.344032) '0.316-0.372': 0.040636) '0.355-0.413': 0.045550, ((Macropus: 0.154672, Aepyprymnus: 0.154672) '0.134-0.176': 0.107743, Hypsiprymnodon: 0.262416) '0.241-0.290': 0.167803) '0.399-0.460': 0.011308, (Cercartetus: 0.411624, Trichosurus: 0.411624) '0.378-0.444': 0.029902) '0.410-0.472': 0.046224, Phascolarctos: 0.487750) '0.452-0.524': 0.074692) '0.524-0.601': 0.015794) '0.539-0.617': 0.087794) '0.622-0.711': 0.049268, (Caenolestes: 0.093086, Rhyncholestes: 0.093086) '0.073-0.122': 0.622211) '0.665-0.764': 0.995723, (((((Echinops: 0.546364, (Amblysomus: 0.086478, Chrysochloris: 0.086478) '0.065-0.107': 0.459886) '0.524-0.576': 0.042477, (Elephantulus: 0.397151, Rhynchocyon: 0.397151) '0.360-0.437': 0.191689) '0.572-0.614': 0.017929, (Heterohyrax: 0.031710, Procavia: 0.031710) '0.023-0.042': 0.575059) '0.588-0.630': 0.156179, (Dasypus: 0.519013, ((Choloepus: 0.171078, Bradypus: 0.171078) '0.149-0.202': 0.277654, Cyclopes: 0.448732) '0.425-0.472': 0.070282) '0.495-0.548': 0.243935) '0.746-0.780': 0.005957, ((((Tragulus: 0.648512, ((((((Prionodon: 0.244890, Felis: 0.244890) '0.223-0.267': 0.029154, ((Fossa: 0.164790, Suricata: 0.164790) '0.145-0.185': 0.099469, Genetta: 0.264259) '0.244-0.286': 0.009786) '0.255-0.296': 0.057340, Nandinia: 0.331384) '0.309-0.357': 0.108423, ((Ailurus: 0.246152, Procyon: 0.246152) '0.228-0.267': 0.013091, Mephitis: 0.259243) '0.244-0.280': 0.180564) '0.415-0.466': 0.198693, (Manis_pentadactyla: 0.172226, Manis_tricuspis: 0.172226) '0.136-0.214': 0.466274) '0.621-0.654': 0.010012) '0.632-0.663': 0.001742, (((((Craseonycteris: 0.393067, Megaderma: 0.393067) '0.367-0.418': 0.050526, Rhinopoma: 0.443593) '0.425-0.461': 0.015637, (Hipposideros: 0.368133, Rhinolophus: 0.368133) '0.347-0.387': 0.091096) '0.440-0.476': 0.060660, Nyctimene: 0.519890) '0.501-0.535': 0.020287, (((((Miniopterus: 0.380747, Myotis: 0.380747) '0.360-0.401': 0.025478, Tadarida: 0.406225) '0.387-0.424': 0.015247, Natalus: 0.421472) '0.403-0.438': 0.019639, Myzopoda: 0.441111) '0.422-0.457': 0.014539, ((Emballonuridae: 0.418756, Nycteris: 0.418756) '0.398-0.438': 0.035286, ((((Furipterus: 0.323921, Noctilio: 0.323921) '0.303-0.345': 0.039084, (Pteronotus: 0.321476, Artibeus: 0.321476) '0.301-0.341': 0.041529) '0.346-0.380': 0.005552, Thyroptera: 0.368556) '0.352-0.385': 0.028253, Mystacina: 0.396810) '0.380-0.414': 0.057232) '0.436-0.470': 0.001608)

'0.437-0.471': 0.084527) '0.523-0.555': 0.110078) '0.634-0.664': 0.013520, ((((Erinaceus: 0.273456, Podogymnura: 0.273456) '0.244-0.308': 0.299332, Sorex: 0.572788) '0.550-0.593': 0.034133, Talpa: 0.606921) '0.587-0.623': 0.006266, Solenodon: 0.613187) '0.594-0.629': 0.050587) '0.647-0.677': 0.058986, ((((Cynocephalus: 0.054674, Galeopterus: 0.054674) '0.042-0.071': 0.607468, ((Callithrix: 0.585458, Tarsius: 0.585458) '0.573-0.597': 0.030167, ((((Microcebus: 0.252489, Propithecus: 0.252489) '0.233-0.272': 0.007809, Lemur: 0.260299) '0.241-0.279': 0.174300, Daubentonia: 0.434599) '0.419-0.449': 0.029891, (Otolemur: 0.186955, Nycticebus: 0.186955) '0.161-0.217': 0.277535) '0.450-0.479': 0.151135) '0.608-0.622': 0.046518) '0.652-0.672': 0.002967, (Ptilocercus: 0.448192, Tupaia: 0.448192) '0.414-0.474': 0.216916) '0.655-0.675': 0.002932, ((Leporidae: 0.384839, Ochotona: 0.384839) '0.351-0.421': 0.262556, (((((((Abrocoma: 0.184785, ((Capromys: 0.123969, (Myocastor: 0.093587, Hoplomys: 0.093587) '0.085-0.102': 0.030382) '0.114-0.134': 0.048063, (Ctenomys: 0.150861, Octodontomys: 0.150861) '0.139-0.163': 0.021171) '0.161-0.183': 0.012754) '0.172-0.196': 0.091479, (Chinchilla: 0.214301, Dinomys: 0.214301) '0.196-0.230': 0.061964) '0.262-0.288': 0.022414, ((Agouti: 0.214803, (Cavia: 0.206275, Dasyprocta: 0.206275) '0.192-0.220': 0.008528) '0.201-0.228': 0.077171, Erethizon: 0.291974) '0.278-0.304': 0.006705) '0.284-0.310': 0.057304, (Heterocephalus: 0.321040, (Petromus: 0.181146, Thryonomys: 0.181146) '0.162-0.200': 0.139894) '0.306-0.333': 0.034943) '0.342-0.367': 0.018040, Hystrix: 0.374023) '0.359-0.387': 0.138834, (Ctenodactylus: 0.359265, Laonastes: 0.359265) '0.329-0.382': 0.153592) '0.497-0.526': 0.070617, (((Anomalurus: 0.461194, Pedetes: 0.461194) '0.442-0.481': 0.086837, (((((Cricetus: 0.200189, Mus: 0.200189) '0.183-0.219': 0.017180, Petromyscus: 0.217368) '0.200-0.235': 0.011364, Calomyscidae: 0.228732) '0.208-0.252': 0.143925, Spalax: 0.372658) '0.356-0.389': 0.084161, Jaculus: 0.456819) '0.441-0.471': 0.091211) '0.536-0.558': 0.006967, (Geomyidae: 0.248243, Dipodomys: 0.248243) '0.215-0.276': 0.306755) '0.542-0.565': 0.028476) '0.571-0.592': 0.003228, ((Aplodontia: 0.432898, Sciuridae: 0.432898) '0.404-0.456': 0.112603, Gliridae: 0.545501) '0.532-0.557': 0.041201) '0.575-0.596': 0.060694) '0.636-0.658': 0.020645) '0.657-0.678': 0.054719) '0.710-0.735': 0.046146) '0.754-0.785': 0.942114) '1.663-1.753': 0.327516, (Ornithorhynchus: 0.291756, Tachyglossus: 0.291756) '0.170-0.446': 1.746780) '1.953-2.099': 1.091350, ((Gallus: 0.756957, Taeniopygia: 0.756957) '0.660-0.866': 1.948921, Anolis: 2.705877) '2.560-2.864': 0.424009) '3.083-3.189': 0.604364, Xenopus: 3.734250) '3.619-3.798': 0.470014, Danio: 4.204264) '4.160-4.253': 0.013211;

B. Independent rates

((((((((((Didelphis: 0.160387, Monodelphis: 0.160387) '0.140-0.183': 0.039431, Glironia: 0.199818) '0.177-0.224': 0.013918, Caluromys: 0.213735) '0.191-0.237': 0.300713, (Dromiciops: 0.428782, ((Notoryctes: 0.411626, (((Isoodon: 0.082784, Echymipera: 0.082784) '0.069-0.098': 0.097708, Macrotis: 0.180492) '0.159-0.200': 0.222169, (Dasyurus: 0.195686, Myrmecobius: 0.195686) '0.172-0.226': 0.206976) '0.384-0.422': 0.008965) '0.394-0.431': 0.003407, ((((Acrobates: 0.273374, ((Petaurus: 0.230813, Pseudochirops: 0.230813) '0.213-0.251': 0.018676, Tarsipes: 0.249489) '0.233-0.269': 0.023885) '0.257-0.293': 0.033601, ((Macropus: 0.118659, Aepyprymnus: 0.118659) '0.101-0.136': 0.086404, Hypsiprymnodon: 0.205063) '0.185-0.227': 0.101912) '0.291-0.327': 0.007443, (Cercartetus: 0.291898, Trichosurus: 0.291898) '0.271-0.312': 0.022520) '0.298-0.335': 0.032528, Phascolarctos: 0.346946) '0.329-0.366': 0.068088) '0.398-0.434': 0.013749) '0.410-0.449': 0.085666) '0.490-0.542': 0.037818, (Caenolestes: 0.072138, Rhyncholestes: 0.072138) '0.058-0.087': 0.480128) '0.533-0.578': 1.087860, (((((Echinops: 0.562169, (Amblysomus: 0.077262, Chrysochloris: 0.077262) '0.065-0.092': 0.484907) '0.534-0.602': 0.047704, (Elephantulus: 0.424791, Rhynchocyon: 0.424791) '0.395-0.468': 0.185081) '0.587-0.648': 0.020831, (Heterohyrax: 0.031521, Procavia: 0.031521) '0.025-0.039': 0.599182) '0.607-0.666': 0.135843, (Dasypus: 0.463452, ((Choloepus: 0.150739, Bradypus: 0.150739) '0.130-0.168': 0.251348, Cyclopes: 0.402088) '0.366-0.437': 0.061364) '0.430-0.499': 0.303094) '0.743-0.789': 0.006039, ((((Tragulus: 0.643321, (((((Prionodon: 0.191106, Felis: 0.191106) '0.168-0.212': 0.031196, ((Fossa: 0.139131, Suricata: 0.139131) '0.118-0.159': 0.075468, Genetta: 0.214600) '0.192-0.234': 0.007702) '0.200-0.241': 0.047454, Nandinia: 0.269755) '0.248-0.285': 0.129021, ((Ailurus: 0.235376, Procyon: 0.235376) '0.219-0.251': 0.011915, Mephitis: 0.247291) '0.233-0.262': 0.151485) '0.376-0.422': 0.229044, (Manis_pentadactyla: 0.156932, Manis_tricuspis: 0.156932) '0.131-0.188': 0.470888) '0.607-0.648': 0.015502) '0.626-0.661': 0.001328, (((((Craseonycteris: 0.374816, Megaderma: 0.374816) '0.349-0.400': 0.031569, Rhinopoma: 0.406385) '0.384-0.430': 0.016843, (Hipposideros: 0.330355, Rhinolophus: 0.330355) '0.307-0.349': 0.092873) '0.403-0.446': 0.046117, Nyctimene: 0.469345) '0.447-0.495': 0.029711, (((((Miniopterus: 0.351668, Myotis: 0.351668) '0.329-0.381': 0.025948, Tadarida: 0.377616) '0.355-0.405': 0.011469, Natalus: 0.389085) '0.368-0.417': 0.022787, Myzopoda: 0.411872) '0.393-0.438': 0.009375, ((Emballonuridae: 0.385062, Nycteris: 0.385062) '0.361-0.414': 0.034473, ((((Furipterus: 0.308499, Noctilio: 0.308499) '0.282-0.336': 0.032193, (Pteronotus: 0.303913, Artibeus: 0.303913) '0.278-0.331': 0.036779) '0.318-0.365': 0.004739, Thyroptera:

0.345431) '0.323-0.370': 0.022313, Mystacina: 0.367744) '0.346-0.392': 0.051791) '0.401-0.446': 0.001713) '0.403-0.447': 0.077808) '0.478-0.524': 0.145594) '0.627-0.662': 0.015406, ((((Erinaceus: 0.326284, Podogymnura: 0.326284) '0.291-0.361': 0.241529, Sorex: 0.567813) '0.548-0.588': 0.033494, Talpa: 0.601308) '0.584-0.619': 0.005691, Solenodon: 0.606998) '0.590-0.626': 0.053057) '0.643-0.677': 0.062888, ((((Cynocephalus: 0.052658, Galeopterus: 0.052658) '0.042-0.066': 0.612704, ((Callithrix: 0.577493, Tarsius: 0.577493) '0.555-0.594': 0.030861, ((((Microcebus: 0.175029, Propithecus: 0.175029) '0.151-0.201': 0.008588, Lemur: 0.183617) '0.159-0.210': 0.175644, Daubentonia: 0.359261) '0.335-0.396': 0.031945, (Otolemur: 0.151535, Nycticebus: 0.151535) '0.129-0.176': 0.239672) '0.370-0.427': 0.217148) '0.590-0.618': 0.057008) '0.651-0.681': 0.003481, (Ptilocercus: 0.435836, Tupaia: 0.435836) '0.399-0.484': 0.233008) '0.655-0.684': 0.003556, ((Leporidae: 0.405317, Ochotona: 0.405317) '0.368-0.438': 0.248070, (((((((Abrocoma: 0.238280, ((Capromys: 0.162147, (Myocastor: 0.127890, Hoplomys: 0.127890) '0.112-0.143': 0.034257) '0.148-0.177': 0.063528, (Ctenomys: 0.188213, Octodontomys: 0.188213) '0.169-0.205': 0.037461) '0.209-0.241': 0.012606) '0.222-0.255': 0.099813, (Chinchilla: 0.238146, Dinomys: 0.238146) '0.211-0.265': 0.099948) '0.320-0.356': 0.021969, ((Agouti: 0.252781, (Cavia: 0.243204, Dasyprocta: 0.243204) '0.222-0.270': 0.009577) '0.231-0.278': 0.096590, Erethizon: 0.349371) '0.332-0.368': 0.010692) '0.343-0.378': 0.057962, (Heterocephalus: 0.372617, (Petromus: 0.238843, Thryonomys: 0.238843) '0.215-0.263': 0.133774) '0.352-0.393': 0.045408) '0.400-0.435': 0.016527, Hystrix: 0.434551) '0.416-0.451': 0.109403, (Ctenodactylus: 0.387232, Laonastes: 0.387232) '0.354-0.416': 0.156722) '0.528-0.560': 0.055441, (((Anomalurus: 0.434511, Pedetes: 0.434511) '0.403-0.469': 0.127370, ((((((Cricetus: 0.247435, Mus: 0.247435) '0.225-0.275': 0.023416, Petromyscus: 0.270851) '0.248-0.297': 0.010688, Calomyscidae: 0.281539) '0.256-0.310': 0.128037, Spalax: 0.409575) '0.388-0.430': 0.081455, Jaculus: 0.491030) '0.471-0.511': 0.070851) '0.549-0.577': 0.007831, (Geomyidae: 0.283762, Dipodomys: 0.283762) '0.246-0.322': 0.285951) '0.558-0.585': 0.029683) '0.590-0.612': 0.003672, ((Aplodontia: 0.403196, Sciuridae: 0.403196) '0.365-0.435': 0.153183, Gliridae: 0.556379) '0.538-0.574': 0.046687) '0.593-0.615': 0.050319) '0.640-0.669': 0.019014) '0.659-0.687': 0.050544) '0.707-0.740': 0.049641) '0.751-0.794': 0.867541) '1.515-1.719': 0.351452, (Ornithorhynchus: 0.218547, Tachyglossus: 0.218547) '0.176-0.261': 1.773031) '1.846-2.089': 1.140664, ((Gallus: 0.701479, Taeniopygia: 0.701479) '0.656-0.789': 1.923700, Anolis: 2.625179) '2.543-2.768': 0.507063) '3.089-3.190': 0.603233, Xenopus: 3.735474) '3.629-3.802': 0.481367, Danio: 4.216841) '4.162-4.255': 0.013211;

dR40 trees with additional s calibration bounds from Springer *et al*. (2017)

Lorisiformes 38.0-56.0 Ma, Lagomorpha 53.7-61.6 Ma, and Emballonuroidea 47.8-59.2 Ma. This calibration scheme also incorporates Springer *et al.*'s [2] maximum bounds for the basal crown divergences of Chiroptera and Primates, and the two deepest rodent clades, with each pushed back to 66 Ma.

A. Autocorrelated rates

((((((((((Didelphis: 0.238715, Monodelphis: 0.238715) '0.206-0.271': 0.061907, Glironia: 0.300622) '0.263-0.332': 0.019962, Caluromys: 0.320584) '0.279-0.353': 0.382278, (Dromiciops: 0.612386, ((Notoryctes: 0.591377, (((Isoodon: 0.108241, Echymipera: 0.108241) '0.091-0.128': 0.162514, Macrotis: 0.270755) '0.231-0.310': 0.306785, (Dasyurus: 0.289278, Myrmecobius: 0.289278) '0.247-0.331': 0.288261) '0.519-0.618': 0.013837) '0.532-0.629': 0.004695, ((((Acrobates: 0.409381, ((Petaurus: 0.340500, Pseudochirops: 0.340500) '0.299-0.371': 0.026317, Tarsipes: 0.366818) '0.325-0.397': 0.042564) '0.363-0.441': 0.048548, ((Macropus: 0.163907, Aepyprymnus: 0.163907) '0.140-0.184': 0.113330, Hypsiprymnodon: 0.277237) '0.247-0.307': 0.180692) '0.410-0.491': 0.012107, (Cercartetus: 0.438982, Trichosurus: 0.438982) '0.390-0.474': 0.031054) '0.421-0.503': 0.048941, Phascolarctos: 0.518977) '0.465-0.556': 0.077095) '0.537-0.634': 0.016314) '0.551-0.654': 0.090475) '0.637-0.747': 0.053290, (Caenolestes: 0.096043, Rhyncholestes: 0.096043) '0.073-0.123': 0.660108) '0.685-0.806': 1.018553, (((((Echinops: 0.629248, (Amblysomus: 0.092196, Chrysochloris: 0.092196) '0.068-0.116': 0.537052) '0.601-0.669': 0.045521, (Elephantulus: 0.468293, Rhynchocyon: 0.468293) '0.420-0.527': 0.206476) '0.653-0.711': 0.020618, (Heterohyrax: 0.033652, Procavia: 0.033652) '0.024-0.044': 0.661734) '0.671-0.732': 0.166096, (Dasypus: 0.595890, ((Choloepus: 0.191584, Bradypus: 0.191584) '0.158-0.231': 0.324681, Cyclopes: 0.516265) '0.482-0.545': 0.079625) '0.563-0.624': 0.265593) '0.838-0.887': 0.007748, ((((Tragulus: 0.742133, (((((Prionodon: 0.280047, Felis: 0.280047) '0.254-0.304': 0.033294, ((Fossa:

0.188017, Suricata: 0.188017) '0.164-0.213': 0.114235, Genetta: 0.302252) '0.278-0.325': 0.011089) '0.290-0.335': 0.066289, Nandinia: 0.379630) '0.353-0.406': 0.121582, ((Ailurus: 0.280621, Procyon: 0.280621) '0.252-0.306': 0.015334, Mephitis: 0.295955) '0.268-0.322': 0.205257) '0.471-0.530': 0.229360, (Manis_pentadactyla: 0.198040, Manis_tricuspis: 0.198040) '0.153-0.251': 0.532531) '0.709-0.753': 0.011562) '0.721-0.764': 0.001708, (((((Craseonycteris: 0.461494, Megaderma: 0.461494) '0.430-0.493': 0.056256, Rhinopoma: 0.517750) '0.497-0.542': 0.018231, (Hipposideros: 0.428867, Rhinolophus: 0.428867) '0.403-0.458': 0.107114) '0.515-0.561': 0.068295, Nyctimene: 0.604277) '0.586-0.627': 0.023673, (((((Miniopterus: 0.455192, Myotis: 0.455192) '0.430-0.480': 0.027938, Tadarida: 0.483130) '0.462-0.506': 0.017588, Natalus: 0.500717) '0.480-0.522': 0.022089, Myzopoda: 0.522806) '0.503-0.544': 0.017163, ((Emballonuridae: 0.509553, Nycteris: 0.509553) '0.488-0.531': 0.029032, ((((Furipterus: 0.386721, Noctilio: 0.386721) '0.360-0.412': 0.044888, (Pteronotus: 0.383820, Artibeus: 0.383820) '0.359-0.408': 0.047789) '0.410-0.453': 0.006789, Thyroptera: 0.438398) '0.418-0.460': 0.033643, Mystacina: 0.472041) '0.452-0.494': 0.066545) '0.520-0.560': 0.001383) '0.522-0.561': 0.087981) '0.610-0.651': 0.115892) '0.723-0.765': 0.014592, ((((Erinaceus: 0.312906, Podogymnura: 0.312906) '0.277-0.356': 0.340685, Sorex: 0.653591) '0.623-0.681': 0.040277, Talpa: 0.693868) '0.668-0.718': 0.006950, Solenodon: 0.700818) '0.677-0.723': 0.057616) '0.738-0.780': 0.060855, ((((Cynocephalus: 0.059743, Galeopterus: 0.059743) '0.044-0.080': 0.695721, ((Callithrix: 0.671311, Tarsius: 0.671311) '0.652-0.692': 0.031910, ((((Microcebus: 0.292510, Propithecus: 0.292510) '0.269-0.316': 0.008842, Lemur: 0.301352) '0.278-0.325': 0.206603, Daubentonia: 0.507955) '0.486-0.529': 0.031963, (Otolemur: 0.288765, Nycticebus: 0.288765) '0.257-0.320': 0.251153) '0.519-0.561': 0.163303) '0.687-0.721': 0.052243) '0.740-0.772': 0.002664, (Ptilocercus: 0.526241, Tupaia: 0.526241) '0.489-0.559': 0.231887) '0.743-0.774': 0.003051, ((Leporidae: 0.547058, Ochotona: 0.547058) '0.526-0.573': 0.190824, (((((((Abrocoma: 0.202649, ((Capromys: 0.135521, (Myocastor: 0.102274, Hoplomys: 0.102274) '0.092-0.113': 0.033246) '0.124-0.148': 0.053142, (Ctenomys: 0.165126, Octodontomys: 0.165126) '0.151-0.180': 0.023537) '0.175-0.203': 0.013986) '0.188-0.217': 0.101408, (Chinchilla: 0.235126, Dinomys: 0.235126) '0.214-0.256': 0.068931) '0.286-0.322': 0.025021, ((Agouti: 0.236776, (Cavia: 0.227627, Dasyprocta: 0.227627) '0.209-0.249': 0.009149) '0.219-0.256': 0.085044, Erethizon: 0.321820) '0.303-0.341': 0.007258) '0.311-0.348': 0.064539, (Heterocephalus: 0.354236, (Petromus: 0.201876, Thryonomys: 0.201876) '0.181-0.225': 0.152361) '0.335-0.374': 0.039381) '0.375-0.413': 0.021645, Hystrix: 0.415262) '0.397-0.434': 0.161632, (Ctenodactylus: 0.399054, Laonastes: 0.399054) '0.368-0.430': 0.177839) '0.561-0.593': 0.082319, (((Anomalurus: 0.529745, Pedetes: 0.529745) '0.508-0.550': 0.091980, (((((Cricetus: 0.231879, Mus: 0.231879) '0.211-0.255': 0.019408, Petromyscus: 0.251287) '0.231-0.274': 0.013656, Calomyscidae: 0.264942) '0.240-0.292': 0.161021, Spalax: 0.425963) '0.407-0.446': 0.096550, Jaculus: 0.522513) '0.505-0.540': 0.099212) '0.611-0.633': 0.007643, (Geomyidae: 0.279702, Dipodomys: 0.279702) '0.241-0.314': 0.349666) '0.618-0.641': 0.029845) '0.651-0.669': 0.003755, ((Aplodontia: 0.494215, Sciuridae: 0.494215) '0.463-0.521': 0.122025, Gliridae: 0.616239) '0.603-0.630': 0.046728) '0.655-0.673': 0.074915) '0.724-0.753': 0.023297) '0.747-0.777': 0.058110) '0.801-0.839': 0.049943) '0.848-0.893': 0.905473) '1.713-1.843': 0.300234, (Ornithorhynchus: 0.303169, Tachyglossus: 0.303169) '0.173-0.481': 1.771769) '2.010-2.124': 1.055629, ((Gallus: 0.784957, Taeniopygia: 0.784957) '0.671-0.866': 1.898769, Anolis: 2.683726) '2.558-2.839': 0.446840) '3.085-3.189': 0.606726, Xenopus: 3.737293) '3.624-3.801': 0.466577, Danio: 4.203870) '4.159-4.253': 0.013211;

B. Independent rates

((((((((((Didelphis: 0.178488, Monodelphis: 0.178488) '0.154-0.205': 0.043049, Glironia: 0.221537) '0.198-0.250': 0.015554, Caluromys: 0.237091) '0.212-0.266': 0.313799, (Dromiciops: 0.471608, ((Notoryctes: 0.453197, (((Isoodon: 0.093097, Echymipera: 0.093097) '0.078-0.110': 0.108311, Macrotis: 0.201408) '0.179-0.225': 0.241440, (Dasyurus: 0.217499, Myrmecobius: 0.217499) '0.192-0.245': 0.225348) '0.421-0.467': 0.010350) '0.432-0.475': 0.003778, ((((Acrobates: 0.299861, ((Petaurus: 0.251744, Pseudochirops: 0.251744) '0.232-0.268': 0.021362, Tarsipes: 0.273106) '0.254-0.290': 0.026755) '0.280-0.317': 0.037996, ((Macropus: 0.130780, Aepyprymnus: 0.130780) '0.112-0.149': 0.094573, Hypsiprymnodon: 0.225353) '0.205-0.245': 0.112504) '0.319-0.355': 0.008228, (Cercartetus: 0.320538, Trichosurus: 0.320538) '0.300-0.341': 0.025547) '0.328-0.364': 0.036448, Phascolarctos: 0.382532) '0.363-0.402': 0.074442) '0.436-0.479': 0.014634) '0.450-0.493': 0.079282) '0.528-0.577': 0.042996, (Caenolestes: 0.080109, Rhyncholestes: 0.080109) '0.065-0.096': 0.513777) '0.563-0.626': 1.099200, (((((Echinops: 0.638187, (Amblysomus: 0.086665, Chrysochloris: 0.086665) '0.072-0.104': 0.551523) '0.604-0.679': 0.054148, (Elephantulus: 0.485789, Rhynchocyon: 0.485789) '0.447-0.535': 0.206546) '0.663-0.734': 0.023305, (Heterohyrax: 0.035006, Procavia: 0.035006) '0.028-0.044': 0.680633) '0.685-0.755': 0.153535, (Dasypus: 0.514591, ((Choloepus: 0.159130, Bradypus: 0.159130) '0.141-0.182': 0.287279, Cyclopes: 0.446409) '0.409-0.488': 0.068182) '0.479-0.560': 0.354584) '0.839-0.902':

0.006998, ((((Tragulus: 0.730941, (((((Prionodon: 0.200360, Felis: 0.200360) '0.179-0.220': 0.033289, ((Fossa: 0.145773, Suricata: 0.145773) '0.125-0.166': 0.079738, Genetta: 0.225511) '0.207-0.244': 0.008138) '0.216-0.251': 0.046949, Nandinia: 0.280598) '0.267-0.295': 0.136115, ((Ailurus: 0.242441, Procyon: 0.242441) '0.223-0.269': 0.013605, Mephitis: 0.256046) '0.238-0.281': 0.160668) '0.394-0.447': 0.296745, (Manis_pentadactyla: 0.176572, Manis_tricuspis: 0.176572) '0.143-0.213': 0.536886) '0.687-0.744': 0.017483) '0.706-0.760': 0.001638, (((((Craseonycteris: 0.432182, Megaderma: 0.432182) '0.399-0.469': 0.034891, Rhinopoma: 0.467073) '0.438-0.501': 0.019184, (Hipposideros: 0.353667, Rhinolophus: 0.353667) '0.332-0.388': 0.132590) '0.458-0.521': 0.061532, Nyctimene: 0.547789) '0.517-0.585': 0.036092, (((((Miniopterus: 0.425447, Myotis: 0.425447) '0.396-0.459': 0.029516, Tadarida: 0.454963) '0.428-0.486': 0.013185, Natalus: 0.468148) '0.442-0.499': 0.026015, Myzopoda: 0.494163) '0.468-0.525': 0.011490, ((Emballonuridae: 0.479343, Nycteris: 0.479343) '0.451-0.512': 0.024770, ((((Furipterus: 0.369438, Noctilio: 0.369438) '0.335-0.406': 0.037696, (Pteronotus: 0.365321, Artibeus: 0.365321) '0.333-0.403': 0.041813) '0.377-0.440': 0.006095, Thyroptera: 0.413229) '0.383-0.447': 0.026328, Mystacina: 0.439556) '0.411-0.472': 0.064557) '0.479-0.535': 0.001540) '0.480-0.537': 0.078228) '0.554-0.619': 0.148697) '0.708-0.761': 0.016890, ((((Erinaceus: 0.367380, Podogymnura: 0.367380) '0.325-0.407': 0.273259, Sorex: 0.640639) '0.613-0.671': 0.038930, Talpa: 0.679568) '0.654-0.707': 0.007168, Solenodon: 0.686736) '0.662-0.715': 0.062732) '0.724-0.776': 0.072361, ((((Cynocephalus: 0.059627, Galeopterus: 0.059627) '0.048-0.075': 0.699087, ((Callithrix: 0.629803, Tarsius: 0.629803) '0.612-0.648': 0.033006, ((((Microcebus: 0.206002, Propithecus: 0.206002) '0.175-0.236': 0.009913, Lemur: 0.215915) '0.185-0.245': 0.216758, Daubentonia: 0.432673) '0.392-0.471': 0.037052, (Otolemur: 0.249998, Nycticebus: 0.249998) '0.217-0.283': 0.219727) '0.431-0.506': 0.193084) '0.650-0.681': 0.095904) '0.733-0.785': 0.004648, (Ptilocercus: 0.499364, Tupaia: 0.499364) '0.453-0.556': 0.263997) '0.739-0.790': 0.005002, ((Leporidae: 0.606142, Ochotona: 0.606142) '0.570-0.637': 0.144347, (((((((Abrocoma: 0.264502, ((Capromys: 0.180470, (Myocastor: 0.141696, Hoplomys: 0.141696) '0.124-0.158': 0.038774) '0.162-0.199': 0.069965, (Ctenomys: 0.208961, Octodontomys: 0.208961) '0.187-0.229': 0.041474) '0.231-0.269': 0.014067) '0.245-0.283': 0.111923, (Chinchilla: 0.263663, Dinomys: 0.263663) '0.231-0.294': 0.112762) '0.354-0.399': 0.024454, ((Agouti: 0.280935, (Cavia: 0.270350, Dasyprocta: 0.270350) '0.242-0.300': 0.010585) '0.253-0.310': 0.107944, Erethizon: 0.388879) '0.365-0.413': 0.012000) '0.378-0.423': 0.064122, (Heterocephalus: 0.414498, (Petromus: 0.264379, Thryonomys: 0.264379) '0.237-0.292': 0.150119) '0.389-0.440': 0.050504) '0.442-0.488': 0.019749, Hystrix: 0.484750) '0.462-0.507': 0.129369, (Ctenodactylus: 0.437846, Laonastes: 0.437846) '0.398-0.474': 0.176274) '0.591-0.635': 0.067067, (((Anomalurus: 0.499464, Pedetes: 0.499464) '0.458-0.541': 0.142646, (((((Cricetus: 0.282956, Mus: 0.282956) '0.254-0.314': 0.026891, Petromyscus: 0.309848) '0.279-0.341': 0.013809, Calomyscidae: 0.323657) '0.290-0.354': 0.144266, Spalax: 0.467923) '0.442-0.494': 0.093131, Jaculus: 0.561054) '0.536-0.586': 0.081056) '0.623-0.662': 0.009962, (Geomyidae: 0.326819, Dipodomys: 0.326819) '0.279-0.374': 0.325253) '0.634-0.671': 0.029115) '0.663-0.701': 0.003130, ((Aplodontia: 0.456989, Sciuridae: 0.456989) '0.413-0.497': 0.173550, Gliridae: 0.630539) '0.602-0.658': 0.053778) '0.666-0.705': 0.066172) '0.728-0.776': 0.017875) '0.745-0.794': 0.053465) '0.796-0.850': 0.054343) '0.848-0.909': 0.816914) '1.623-1.745': 0.348426, (Ornithorhynchus: 0.239153, Tachyglossus: 0.239153) '0.196-0.286': 1.802359) '1.945-2.101': 1.099623, ((Gallus: 0.751863, Taeniopygia: 0.751863) '0.665-0.854': 1.866365, Anolis: 2.618227) '2.544-2.755': 0.522907) '3.099-3.215': 0.606105, Xenopus: 3.747239) '3.653-3.811': 0.471047, Danio: 4.218286) '4.164-4.256': 0.013211;

128-taxon trees

These analyses restore taxa that are 10-30kg, but still <40 years maximum longevity. Including these additional moderately large mammals and their respective calibration priors (Supplemental file 2: Table S2) has a very small upwards impact on divergence estimates, which remain consistent with the soft explosive model. Relative to the average for the 122-taxon dr40trees, the midpoint for the primary placental interordinal diversification increases from 64.6 Ma to 65.3 Ma

A. Autocorrelated rates

((((((((((Didelphis: 0.217938, Monodelphis: 0.217938) '0.189-0.252': 0.057838, Glironia: 0.275776) '0.247-0.312': 0.018646, Caluromys: 0.294422) '0.261-0.333': 0.357596, (Dromiciops: 0.561700, ((Notoryctes: 0.540882, (((Isoodon: 0.100309, Echymipera: 0.100309) '0.085-0.120': 0.140383, Macrotis: 0.240692) '0.212-0.281': 0.287826, (Dasyurus: 0.250721, Myrmecobius: 0.250721) '0.214-0.301': 0.277797) '0.502-0.582': 0.012364) '0.514-0.593': 0.005280, ((((Acrobates: 0.371076, ((Petaurus: 0.306265, Pseudochirops: 0.306265) '0.286-0.341': 0.024042, Tarsipes: 0.330307) '0.310-0.366': 0.040769) '0.351-0.408': 0.040335, ((Macropus: 0.145159, Aepyprymnus: 0.145159) '0.125-0.170': 0.109298, Hypsiprymnodon: 0.254457) '0.236-0.283': 0.156954) '0.390-0.451': 0.009754, (Cercartetus: 0.387480, Trichosurus: 0.387480) '0.364-0.429': 0.033685) '0.400-0.461': 0.043940, (Phascolarctos: 0.274429, Vombatus: 0.274429) '0.246-0.313': 0.190676) '0.441-0.511': 0.081057) '0.519-0.596': 0.015538) '0.533-0.615': 0.090318) '0.618-0.710': 0.046761, (Caenolestes: 0.095444, Rhyncholestes: 0.095444) '0.074-0.125': 0.603335) '0.662-0.766': 1.018432, (((((Echinops: 0.546325, (Amblysomus: 0.087584, Chrysochloris: 0.087584) '0.065-0.107': 0.458740) '0.523-0.584': 0.043715, (Elephantulus: 0.391864, Rhynchocyon: 0.391864) '0.358-0.439': 0.198176) '0.573-0.621': 0.017981, (Heterohyrax: 0.030859, Procavia: 0.030859) '0.022-0.040': 0.577163) '0.590-0.638': 0.159508, (Dasypus: 0.507199, ((Choloepus: 0.168744, Bradypus: 0.168744) '0.147-0.197': 0.276559, (Cyclopes: 0.288827, Myrmecophaga: 0.288827) '0.252-0.324': 0.156477) '0.420-0.464': 0.061896) '0.476-0.530': 0.260329) '0.751-0.786': 0.005542, ((((((Moschus: 0.313777, Tragulus: 0.313777) '0.285-0.337': 0.198291, Pecari: 0.512069) '0.498-0.531': 0.142618, (((((Prionodon: 0.244682, Felis: 0.244682) '0.224-0.267': 0.030185, ((Fossa: 0.164963, Suricata: 0.164963) '0.144-0.186': 0.100718, Genetta: 0.265680) '0.247-0.286': 0.009187) '0.256-0.296': 0.054735, Nandinia: 0.329602) '0.312-0.353': 0.109972, ((Ailurus: 0.249086, (Procyon: 0.229851, Meles: 0.229851) '0.213-0.250': 0.019236) '0.234-0.268': 0.010287, Mephitis: 0.259373) '0.245-0.278': 0.180201) '0.419-0.459': 0.199976, (Manis_pentadactyla: 0.176998, Manis_tricuspis: 0.176998) '0.138-0.221': 0.462552) '0.624-0.655': 0.015137) '0.640-0.669': 0.000731, (((((Craseonycteris: 0.392016, Megaderma: 0.392016) '0.369-0.415': 0.049520, Rhinopoma: 0.441535) '0.426-0.458': 0.015038, (Hipposideros: 0.366741, Rhinolophus: 0.366741) '0.347-0.386': 0.089832) '0.442-0.473': 0.061818, Nyctimene: 0.518391) '0.505-0.532': 0.021839, (((((Miniopterus: 0.378393, Myotis: 0.378393) '0.361-0.396': 0.026621, Tadarida: 0.405014) '0.390-0.421': 0.015510, Natalus: 0.420523) '0.407-0.435': 0.020096, Myzopoda: 0.440619) '0.427-0.455': 0.014639, ((Emballonuridae: 0.417830, Nycteris: 0.417830) '0.401-0.435': 0.035827, ((((Furipterus: 0.321873, Noctilio: 0.321873) '0.303-0.339': 0.040345, (Pteronotus: 0.319471, Artibeus: 0.319471) '0.301-0.335': 0.042747) '0.348-0.376': 0.005010, Thyroptera: 0.367228) '0.353-0.381': 0.028446, Mystacina: 0.395674) '0.382-0.410': 0.057983) '0.441-0.467': 0.001601) '0.443-0.468': 0.084972) '0.525-0.554': 0.115187) '0.641-0.669': 0.013687, ((((Erinaceus: 0.277165, Podogymnura: 0.277165) '0.246-0.312': 0.299818, Sorex: 0.576983) '0.558-0.597': 0.035557, Talpa: 0.612541) '0.596-0.628': 0.006745, Solenodon: 0.619286) '0.604-0.635': 0.049818) '0.655-0.683': 0.057026, ((((Cynocephalus: 0.055888, Galeopterus: 0.055888) '0.043-0.072': 0.606905, ((Callithrix: 0.584318, Tarsius: 0.584318) '0.572-0.597': 0.031735, ((((Microcebus: 0.249924, Propithecus: 0.249924) '0.232-0.269': 0.007665, Lemur: 0.257589) '0.239-0.276': 0.174178, Daubentonia: 0.431767) '0.417-0.447': 0.029018, (Otolemur: 0.191179, Nycticebus: 0.191179) '0.165-0.219': 0.269605) '0.448-0.475': 0.155268) '0.609-0.624': 0.046740) '0.653-0.673': 0.003034, (Ptilocercus: 0.446257, Tupaia: 0.446257) '0.414-0.469': 0.219569) '0.656-0.676': 0.003307, ((Leporidae: 0.380274, Ochotona: 0.380274) '0.350-0.415': 0.269648, (((((((Abrocoma: 0.186099, ((Capromys: 0.124939, (Myocastor: 0.094771, Hoplomys: 0.094771) '0.086-0.104': 0.030169) '0.115-0.135': 0.048523, (Ctenomys: 0.152276, Octodontomys: 0.152276) '0.141-0.164': 0.021186) '0.163-0.184': 0.012637) '0.175-0.198': 0.091680, (Chinchilla: 0.215920, Dinomys: 0.215920) '0.200-0.231': 0.061859) '0.266-0.290': 0.022579, ((Agouti: 0.216843, (Cavia: 0.208064, Dasyprocta: 0.208064) '0.195-0.222': 0.008779) '0.204-0.230': 0.077132, Erethizon: 0.293975) '0.282-0.306': 0.006383) '0.289-0.312': 0.056920, (Heterocephalus: 0.322113, (Petromus: 0.181071, Thryonomys: 0.181071) '0.162-0.200': 0.141041) '0.310-0.334': 0.035166) '0.346-0.368': 0.017967, Hystrix: 0.375245) '0.363-0.387': 0.137981, (Ctenodactylus: 0.365450, Laonastes: 0.365450) '0.343-0.385': 0.147776) '0.500-0.525': 0.070965, (((Anomalurus: 0.451360, Pedetes: 0.451360) '0.431-0.468': 0.095496, (((((Cricetus: 0.200208, Mus: 0.200208) '0.185-0.217': 0.016638, Petromyscus: 0.216846) '0.202-0.233': 0.010926, Calomyscidae: 0.227772) '0.209-0.248': 0.144251, Spalax: 0.372024) '0.358-0.387': 0.081012, Jaculus: 0.453035) '0.439-0.466': 0.093821) '0.535-0.556': 0.005567, (Castor: 0.509792, (Geomyidae: 0.229782, Dipodomys: 0.229782) '0.200-0.260': 0.280010) '0.496-0.522': 0.042632) '0.541-0.562': 0.031767) '0.573-0.593': 0.002799, ((Aplodontia: 0.431487, Sciuridae: 0.431487) '0.402-0.455': 0.115890, Gliridae: 0.547377) '0.535-0.559': 0.039613) '0.576-0.596': 0.062933) '0.639-0.661': 0.019211) '0.659-0.678': 0.056997) '0.713-0.739': 0.046940) '0.758-0.789': 0.944141) '1.674-1.766': 0.324199, (Ornithorhynchus: 0.302551, Tachyglossus: 0.302551) '0.185-0.510': 1.738859) '1.960-2.099': 1.089116, ((Gallus: 0.756747, Taeniopygia: 0.756747) '0.662-0.865': 1.936147, Anolis: 2.692894) '2.558-2.849': 0.437632)

'3.085-3.190': 0.606820, Xenopus: 3.737346) '3.631-3.804': 0.466153, Danio: 4.203499) '4.160-4.254': 0.000004;

B. Independent rates

((((((((((Didelphis: 0.162017, Monodelphis: 0.162017) '0.141-0.187': 0.039839, Glironia: 0.201855) '0.180-0.227': 0.014537, Caluromys: 0.216393) '0.193-0.242': 0.302095, (Dromiciops: 0.432836, ((Notoryctes: 0.415125, (((Isoodon: 0.084020, Echymipera: 0.084020) '0.070-0.099': 0.099201, Macrotis: 0.183221) '0.161-0.206': 0.222759, (Dasyurus: 0.197929, Myrmecobius: 0.197929) '0.174-0.226': 0.208051) '0.386-0.426': 0.009145) '0.396-0.435': 0.003841, ((((Acrobates: 0.275369, ((Petaurus: 0.231799, Pseudochirops: 0.231799) '0.214-0.252': 0.019117, Tarsipes: 0.250916) '0.234-0.271': 0.024453) '0.258-0.295': 0.033349, ((Macropus: 0.119242, Aepyprymnus: 0.119242) '0.101-0.137': 0.086585, Hypsiprymnodon: 0.205827) '0.185-0.227': 0.102891) '0.291-0.328': 0.006762, (Cercartetus: 0.291795, Trichosurus: 0.291795) '0.271-0.312': 0.023685) '0.297-0.334': 0.034272, (Phascolarctos: 0.213407, Vombatus: 0.213407) '0.183-0.242': 0.136345) '0.332-0.368': 0.069214) '0.401-0.438': 0.013869) '0.413-0.453': 0.085652) '0.495-0.545': 0.036556, (Caenolestes: 0.073916, Rhyncholestes: 0.073916) '0.061-0.088': 0.481128) '0.535-0.583': 1.096340, (((((Echinops: 0.569204, (Amblysomus: 0.078258, Chrysochloris: 0.078258) '0.066-0.093': 0.490946) '0.538-0.614': 0.048705, (Elephantulus: 0.429371, Rhynchocyon: 0.429371) '0.397-0.472': 0.188539) '0.591-0.662': 0.020452, (Heterohyrax: 0.031522, Procavia: 0.031522) '0.025-0.039': 0.606839) '0.610-0.680': 0.138100, (Dasypus: 0.448157, ((Choloepus: 0.151460, Bradypus: 0.151460) '0.131-0.169': 0.241655, (Cyclopes: 0.262222, Myrmecophaga: 0.262222) '0.231-0.299': 0.130893) '0.363-0.423': 0.055042) '0.425-0.481': 0.328304) '0.751-0.803': 0.005800, ((((((Moschus: 0.328840, Tragulus: 0.328840) '0.301-0.360': 0.179645, Pecari: 0.508485) '0.493-0.532': 0.144662, (((((Prionodon: 0.192961, Felis: 0.192961) '0.172-0.212': 0.032029, ((Fossa: 0.140347, Suricata: 0.140347) '0.120-0.160': 0.077403, Genetta: 0.217750) '0.199-0.235': 0.007241) '0.206-0.241': 0.046696, Nandinia: 0.271687) '0.253-0.285': 0.127315, ((Ailurus: 0.236771, (Procyon: 0.220304, Meles: 0.220304) '0.203-0.235': 0.016466) '0.222-0.251': 0.008400, Mephitis: 0.245170) '0.231-0.258': 0.153831) '0.378-0.424': 0.234206, (Manis_pentadactyla: 0.158387, Manis_tricuspis: 0.158387) '0.133-0.189': 0.474820) '0.609-0.653': 0.019940) '0.634-0.671': 0.000599, (((((Craseonycteris: 0.383034, Megaderma: 0.383034) '0.357-0.407': 0.030559, Rhinopoma: 0.413592) '0.390-0.435': 0.016372, (Hipposideros: 0.334253, Rhinolophus: 0.334253) '0.311-0.354': 0.095711) '0.408-0.450': 0.048368, Nyctimene: 0.478333) '0.452-0.502': 0.030584, (((((Miniopterus: 0.356171, Myotis: 0.356171) '0.331-0.381': 0.027737, Tadarida: 0.383909) '0.361-0.406': 0.011708, Natalus: 0.395617) '0.373-0.417': 0.023497, Myzopoda: 0.419114) '0.398-0.439': 0.009502, ((Emballonuridae: 0.391484, Nycteris: 0.391484) '0.366-0.414': 0.035388, ((((Furipterus: 0.310659, Noctilio: 0.310659) '0.283-0.335': 0.033486, (Pteronotus: 0.306410, Artibeus: 0.306410) '0.281-0.330': 0.037735) '0.322-0.365': 0.004613, Thyroptera: 0.348758) '0.326-0.370': 0.023165, Mystacina: 0.371924) '0.351-0.393': 0.054948) '0.407-0.446': 0.001745) '0.409-0.447': 0.080300) '0.485-0.532': 0.144829) '0.634-0.671': 0.014623, ((((Erinaceus: 0.331142, Podogymnura: 0.331142) '0.295-0.364': 0.242291, Sorex: 0.573433) '0.553-0.597': 0.033541, Talpa: 0.606973) '0.590-0.627': 0.006452, Solenodon: 0.613426) '0.597-0.634': 0.054943) '0.651-0.686': 0.061404, ((((Cynocephalus: 0.052745, Galeopterus: 0.052745) '0.042-0.065': 0.616187, ((Callithrix: 0.576025, Tarsius: 0.576025) '0.555-0.594': 0.033084, ((((Microcebus: 0.180315, Propithecus: 0.180315) '0.152-0.206': 0.008776, Lemur: 0.189090) '0.161-0.216': 0.172658, Daubentonia: 0.361749) '0.335-0.401': 0.032663, (Otolemur: 0.154470, Nycticebus: 0.154470) '0.133-0.177': 0.239942) '0.372-0.430': 0.214697) '0.590-0.618': 0.059823) '0.654-0.685': 0.003497, (Ptilocercus: 0.438620, Tupaia: 0.438620) '0.401-0.492': 0.233809) '0.658-0.688': 0.003456, ((Leporidae: 0.407062, Ochotona: 0.407062) '0.364-0.440': 0.250289, (((((((Abrocoma: 0.238375, ((Capromys: 0.162607, (Myocastor: 0.128518, Hoplomys: 0.128518) '0.112-0.147': 0.034089) '0.146-0.181': 0.062992, (Ctenomys: 0.188012, Octodontomys: 0.188012) '0.169-0.205': 0.037586) '0.210-0.242': 0.012776) '0.223-0.255': 0.099639, (Chinchilla: 0.236871, Dinomys: 0.236871) '0.211-0.263': 0.101143) '0.320-0.356': 0.021949, ((Agouti: 0.250722, (Cavia: 0.241060, Dasyprocta: 0.241060) '0.222-0.267': 0.009662) '0.231-0.275': 0.099074, Erethizon: 0.349796) '0.331-0.369': 0.010167) '0.343-0.378': 0.057310, (Heterocephalus: 0.371402, (Petromus: 0.238332, Thryonomys: 0.238332) '0.215-0.263': 0.133069) '0.351-0.391': 0.045871) '0.401-0.434': 0.016486, Hystrix: 0.433759) '0.416-0.451': 0.111956, (Ctenodactylus: 0.391844, Laonastes: 0.391844) '0.359-0.423': 0.153871) '0.529-0.562': 0.056189, (((Anomalurus: 0.432250, Pedetes: 0.432250) '0.402-0.465': 0.130943, (((((Cricetus: 0.247204, Mus: 0.247204) '0.222-0.277': 0.023180, Petromyscus: 0.270384) '0.245-0.300': 0.010590, Calomyscidae: 0.280974) '0.253-0.312': 0.131249, Spalax: 0.412223) '0.389-0.434': 0.080913, Jaculus: 0.493136) '0.472-0.513': 0.070057) '0.550-0.577': 0.006254, (Castor: 0.515306, (Geomyidae: 0.273589, Dipodomys: 0.273589) '0.238-0.309': 0.241717) '0.496-0.536': 0.054141) '0.558-0.583': 0.032457) '0.591-0.614': 0.003501, ((Aplodontia: 0.407173, Sciuridae: 0.407173)

'0.369-0.439': 0.153047, Gliridae: 0.560220) '0.541-0.576': 0.045185) '0.594-0.616': 0.051946) '0.643-0.672': 0.018534) '0.662-0.691': 0.053887) '0.711-0.750': 0.052489) '0.758-0.808': 0.869122) '1.544-1.723': 0.355493, (Ornithorhynchus: 0.221442, Tachyglossus: 0.221442) '0.182-0.263': 1.785435) '1.888-2.091': 1.126253, ((Gallus: 0.703248, Taeniopygia: 0.703248) '0.659-0.790': 1.917406, Anolis: 2.620654) '2.543-2.756': 0.512476) '3.087-3.196': 0.608338, Xenopus: 3.741468) '3.639-3.804': 0.475562, Danio: 4.217030) '4.163-4.256': 0.000004;

57-taxon trees

These analyses on Liu *et al*.'s [11] 200-gene "1st quintile" DNA alignments exclude taxa >10kg and/or >40 years maximum longevity, and employ our dR40 calibrations that are compatible with the 57 taxa (Supplemental file 2: Table S2). All age values are averages over two separate MCMCtree runs for each of Liu *et al*.'s [11] three alignments. Compared to the original analyses [11] the midpoint for the primary placental interordinal diversification falls from 68.0 Ma to 63.2 Ma with the independent rates model, and from 94.7 Ma to 69.8 Ma with the autocorrelated rates model.

A. Autocorrelated rates

((danio_rer:4.009951167,gaste_acu:4.009951167)'3.901915-4.098745':0.153061,(xenop_tro:2.992037167,((anoli_car:2.235592,(pelod_sin:2.074507833,(melea_gal:0.630073667,gallu_gal:0.630073667)'0.560042-0.705630167':1.444434167)'1.974931667-2.179188333':0.161084)'2.136506667-2.340271667':0.274776667,(ornit_ana:1.961570167,((monod_dom:0.858418667,(macro_eug:0.721901333,sarco_har:0.721901333)'0.6876665-0.7722115':0.1365175)'0.824001333-0.909996667':0.786791833,(((dasyp_nov:0.642396667,cholo_hof:0.642396667)'0.6217875-0.662141667':0.167905,(proca_cap:0.695113,(echin_tel:0.6559355,(eleph_edw:0.6302145,chrys_asi:0.6302145)'0.61194-0.648303':0.025720833)'0.6381375-0.6734135':0.039177667)'0.677990833-0.712359333':0.115188667)'0.794834833-0.8264565':0.0159955,(((condy_cri:0.649287333,(erina_eur:0.578980167,sorex_ara:0.578980167)'0.5618925-0.5952485':0.070307333)'0.634486-0.663438833':0.0766,(((ptero_par:0.541694667,(eptes_fus:0.249276667,myoti_luc:0.249276667)'0.2343395-0.264716333':0.292418)'0.525374833-0.5571655':0.092581833,((megad_lyr:0.538334167,rhino_fer:0.538334167)'0.5197005-0.555794667':0.068168667,(eidol_hel:0.313999667,(ptero_ale:0.164221167,ptero_vam:0.164221167)'0.150771833-0.178123333':0.1497785)'0.296381833-0.331669667':0.292503)'0.591754-0.620634667':0.027773667)'0.620136667-0.647733':0.076622,(manis_pen:0.678470833,(felis_cat:0.519982833,muste_put:0.519982833)'0.502780333-0.537512833':0.158487667)'0.663186-0.692583833':0.032428)'0.6972925-0.72352':0.014988667)'0.712554-0.738672833':0.0499495,(((tupai_bel:0.116492667,tupai_chi:0.116492667)'0.103172683-0.130656833':0.590893833,((ochot_pri:0.4496455,oryct_cun:0.4496455)'0.43451-0.464646333':0.2251665,(ictid_tri:0.6178115,((heter_gla:0.378906667,(cavia_por:0.319763,(chinc_lan:0.284177,octod_deg:0.284177)'0.273031-0.295333':0.035585833)'0.3083465-0.3312255':0.059144)'0.367387667-0.390659833':0.220072333,(dipod_ord:0.559421,(jacul_jac:0.486974167,((mus_mus:0.179309333,rattu_nor:0.179309333)'0.1704165-0.188362833':0.1136225,(perom_man:0.247835333,(micro_och:0.236000667,(crice_gri:0.166356833,mesoc_aur:0.166356833)'0.1581175-0.174942333':0.069643833)'0.2266905-0.245639833':0.011835)'0.238454-0.257550667':0.0450965)'0.2830045-0.303048':0.194042167)'0.477885167-0.4964675':0.072447)'0.551882-0.5675155':0.039558167)'0.592421833-0.606956333':0.018832333)'0.612064833-0.625620167':0.0570005)'0.666282-0.684486667':0.0325745)'0.697721667-0.718041333':0.009152833,(galeo_var:0.7031305,((daube_mad:0.558675833,(otole_gar:0.523555667,micro_mur:0.523555667)'0.5094505-0.536934':0.035119833)'0.5461475-

0.5707385':0.100583833,(tarsi_syr:0.631945333,((saimi_bol:0.261519,calli_jac:0.261519)'0.246731667-0.276653167':0.1607955,(chlor_sab:0.167150833,macac_fas:0.167150833)'0.152353667-0.1823455':0.255163833)'0.406906833-0.437700667':0.209630833)'0.619986833-0.644151833':0.027314)'0.648272833-0.670448667':0.043871167)'0.692608167-0.714245':0.013409)'0.7065795-0.727328':0.059298)'0.763064667-0.788878167':0.050460333)'0.811315333-0.841789':0.818912833)'1.583878333-1.706136667':0.316359667)'1.884631667-2.039041667':0.548798333)'2.409576667-2.617465':0.481668833)'2.880176667-3.11035':1.170975)'4.1496-4.182095':0.008608333;

B. Independent rates

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Calculation of the midpoint of the placental mammal diversification

Most recent molecular dating studies (e.g. [1-4]) acknowledge that there is close temporal correspondence between the initial diversifications within Laurasiatheria, Euarchantoglires,

and Afrotheria, while the divergences between these superorders occurred somewhat earlier, and the paenungulate crown originated later. To standardize the variation in timing of the primary interordinal diversification of placental mammals across studies we calculated the diversification midpoint as the median of the relevant interordinal nodes. Hence, our median is calculated from among twelve node ages: the five Laurasiatheria nodes among Lipotyphla, Chiroptera, Artiodactyla, Perissodactyla, Carnivora, and Pholidota, the four Euarchontoglires nodes among Primates, Dermoptera, Scandentia, Rodentia, and Lagomorpha, and the three Afrotheria nodes among Paenungulata, Macroscelidea, Afrosoricida, and Tubulidentata. Relationships within the superorders vary slightly across studies, and so we do not assume a particular phylogeny, but regard the median as falling between the 6th and 7th oldest of the twelve nodes across those three superorders.

In some cases not all nodes are present, but the appropriate midpoint for comparison can still be deduced. One example is our 122-taxon dR32 analysis, which is missing Perissodactyla (therefore, the Zoomata node) and Tubulidentata (therefore, the Afroinsectiphilia node). Among the ten available nodes, we can see that the parent nodes of Zoomata and Afroinsectiphilia are already younger than the 6th and 7th oldest nodes and therefore, the missing nodes must be younger still. Hence, we can still calculate the median between the 6th and 7th oldest of the twelve relevant nodes.

In rare cases the 6th or 7th oldest node was missing due to the exclusion of large, long-lived taxa. This could be interpolated with reference to the result from the full dataset. For example, Zoomata would be the 7th oldest node for the 57-taxon, autocorrelated timetree. The clade age was interpolated between the estimated dates for Scrotifera and Ferae, given the timing of Zoomata at 74% of the age difference between these older and younger nodes for the full dataset autocorrelated analysis.

Where studies presented more than one set of dates, we focused on those that were presented in the main figure or table. When no single tree was clearly preferred we averaged the median over multiple timetrees (e.g. the four combinations of model and bound type for [2]). For Halliday *et al.* [5], divergence times were obtained based on all the trees they obtained across multiple analyses using different constraints (T.J. Halliday, *pers. comm.*). Each tree was first pruned to only the species these authors assigned to an order. Then, for each of our focal

nodes described above, we retained only those trees in which the node was monophyletic, and computed the median time across all the retained trees.

Table S3. Placental interordinal diversification midpoints. Timetrees are classified into models of placental interordinal diversification: short-fuse has interordinal and most ordinal crown divergences in the Cretaceous, long-fuse has Cretaceous interordinal divergences and mostly Cenozoic ordinal crown divergences, hard explosive has all interordinal divergences close to or following the 66 Ma KPg boundary, soft explosive has most interordinal divergences close to or following the 66 Ma KPg boundary, but allows for earlier divergences between the superorders (Laurasiatheria, Euarchantoglires, Afrotheria, and Xenarthra). Note that some timetrees have elements of two models.

Study	Midpoint (Ma)	Placental diversification model & (method)
Bininda-Emonds *et al.* [6][a]	88.4	Short-fuse (molecular dating)
Murphy *et al.* [7]	84.4	Short/long-fuse (molecular dating)
Springer *et al.* [8]	82.0	Short/long-fuse (molecular dating)
Meredith *et al.* [3]	81.4	Short/long-fuse (molecular dating)
Timetree.org (30/01/2017)	78.5	Short/long-fuse (molecular dating)
Lartillot *et al.* [9] [b]	75.0	Long-fuse (molecular dating)
Springer *et al.* [2]	74.1	Long-fuse (molecular dating)
Tarver *et al.* [10]	72.0	Long-fuse (molecular dating)
dos Reis *et al.* [4]	71.0	Long-fuse (molecular dating)
Liu et al. [11][c]	68.0	Long-fuse/soft explosive (molecular dating)
Ronquist *et al.* [12][d]	67.0	Long-fuse/soft explosive (Total evidence)
Halliday *et al.* [5]	65.1	Hard explosive (Fossil tip dating)
Phillips [1][e]	64.6	Soft explosive (molecular dating)
This study (122-taxon dR40)[f]	**64.6**	Soft explosive (molecular dating)
This study (57-taxon)[c]	**63.2**	Soft explosive (molecular dating)

[a]Based on the corrected dates associated with the published corrigendum

[b]Mixed-clock (independent/autocorrelated), tip dating, DNA matrix only

[c]Liu *et al.*'s [11] favoured genewise-partitioned, independent rates analyses, averaged over their three "1st quintile" 200 gene alignments.

[d]Total evidence dating, rapid diversification model

[e]dR27 analysis, with independent rates, soft calibration bounds

[f]Average of the independent and autocorrelated rates analyses

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