**Supplementary Materials:** Ecological and biogeographic processes drive the proteome evolution of snake venom

**Table S1.** Snake venom proteomes and ecological variables for all species. Phopolispases A2 (PLA2); snake venom serine proteases (SVSP); snake venom metalloproteases (SVMP); Kunitz peptides (KUN); 3-finger toxins (3FT); L-amino acid oxidases (LAAO); cysteine-rich secretory proteins (CRiSP); C-type lectins (CTL); disintegrins (DIS); natriuretic peptides (NP); Venom Complexity (V\_comp); Average Annual Temperature (Bio1); Precipitation Seasonality (Bio15); Net Primary Productivity (NPP); speed of Temperature Change in the last 21 thousand years (Velocity); body size in grams (Mass) and Local (M=Mainland and I=Island).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Family** | **Species** | **PLA2** | **SVSP** | **SVMP** | **KUN** | **3FT** | **LAAO** | **CRiSP** | **CTL** | **DIS** | **NP** | **V\_comp** | **Mass** | **Bio1** | **Bio15** | **Velocity** | **NPP** | **Local** |
| Viperidae | *Agkistrodon\_bilineatus* | 38.15 | 12.25 | 27.65 | 0 | 0 | 3.75 | 2.8 | 0.9 | 2.65 | 6.65 | 0.2378 | 1330.6 | 243.77 | 99.79 | 2.93 | 1555.80 | M |
| Viperidae | *Atropoides\_nummifer* | 36.5 | 22 | 18.2 | 0 | 0 | 9.1 | 1.9 | 1.3 | 2.5 | 8.6 | 0.2552 | 347.5 | 212.37 | 67.73 | 2.66 | 1992.50 | M |
| Viperidae | *Atropoides\_picadoi* | 9.5 | 13.5 | 66.4 | 0 | 0 | 2.2 | 4.8 | 1.8 | 0.1 | 1.8 | 0.0862 | 890.3 | 210.57 | 42.43 | 2.67 | 2196.58 | M |
| Elapidae | *Austrelaps\_labialis* | 33 | 0 | 3 | 9 | 45 | 0 | 8 | 0 | 0 | 0 | 0.1585 | 180.5 | 147.15 | 53.39 | 5.45 | 965.17 | I |
| Viperidae | *Bitis\_arietans* | 4.3 | 19.5 | 38.5 | 4.2 | 0 | 0 | 0 | 13.2 | 17.8 | 0 | 0.2442 | 3122.3 | 212.49 | 69.44 | 4.92 | 1166.27 | M |
| Viperidae | *Bitis\_caudalis* | 59.8 | 15.1 | 11.5 | 3.2 | 0 | 1.7 | 1.2 | 4.9 | 2.3 | 0 | 0.1163 | 117.9 | 192.13 | 87.03 | 4.27 | 585.18 | M |
| Viperidae | *Bitis\_gabonica* | 11.4 | 26.4 | 22.9 | 3 | 0 | 1.3 | 2 | 14.3 | 3.4 | 2.8 | 0.3545 | 2883 | 245.35 | 62.25 | 5.55 | 1732.59 | M |
| Viperidae | *Bitis\_nasicornis* | 20.1 | 21.9 | 40.9 | 0 | 0 | 3.2 | 1.3 | 4.2 | 3.5 | 0 | 0.2152 | 886 | 247.04 | 63.79 | 4.78 | 1800.38 | M |
| Viperidae | *Bitis\_rhinoceros* | 4.8 | 23.9 | 30.8 | 7.5 | 0 | 2.2 | 1.2 | 14.1 | 8.5 | 0.3 | 0.3211 | 3025.1 | 267.36 | 67.27 | 5.23 | 1909.41 | M |
| Viperidae | *Bothriechis\_aurifer* | 0 | 7.3 | 35.1 | 0 | 0 | 9.5 | 10.7 | 16.4 | 1.4 | 13.4 | 0.3174 | 521.2 | 182.18 | 62.29 | 0.80 | 1892.62 | M |
| Viperidae | *Bothriechis\_bicolor* | 35.2 | 19.1 | 8.5 | 0 | 0 | 10.8 | 1 | 4.4 | 7.6 | 3.6 | 0.3269 | 521.2 | 215.61 | 87.91 | 0.74 | 2016.94 | M |
| Viperidae | *Bothriechis\_lateralis* | 8.7 | 11.3 | 55.1 | 0 | 0 | 6.1 | 6.5 | 0 | 0 | 11.1 | 0.1466 | 521.2 | 208.39 | 59.76 | 2.20 | 2177.80 | M |
| Viperidae | *Bothriechis\_marchi* | 14.3 | 10.1 | 34.2 | 0 | 0 | 1.1 | 2.8 | 4.2 | 6.5 | 10.6 | 0.3678 | 474.1 | 228.53 | 40.82 | 3.10 | 2178.73 | M |
| Viperidae | *Bothriechis\_nigroviridis* | 38.3 | 18.4 | 0 | 0 | 0 | 0.5 | 2.1 | 0 | 0 | 37 | 0.1650 | 431.3 | 182.65 | 53.95 | 1.73 | 2257.24 | M |
| Viperidae | *Bothriechis\_schlegelii* | 43.8 | 5.8 | 17.7 | 0 | 0 | 8.9 | 2.1 | 0 | 0 | 13.4 | 0.2273 | 292.5 | 232.17 | 43.60 | 2.41 | 2272.28 | M |
| Viperidae | *Bothriechis\_supraciliaris* | 13.4 | 15.2 | 6.8 | 0 | 0 | 5.9 | 4.3 | 0 | 1.6 | 21.9 | 0.6983 | 272.3 | 199.33 | 60.33 | 1.56 | 2447.61 | M |
| Viperidae | *Bothriechis\_thalassinus* | 0 | 12.1 | 39.6 | 0 | 0 | 4.3 | 5.1 | 11.5 | 2 | 10.6 | 0.2884 | 521.2 | 202.30 | 67.30 | 0.77 | 2091.98 | M |
| Viperidae | *Bothrocophias\_campbelli* | 43.1 | 21.3 | 15.8 | 0 | 0 | 5.7 | 0.9 | 6.4 | 0.3 | 3.9 | 0.2133 | 952 | 186.50 | 45.07 | 1.22 | 2015.77 | M |
| Viperidae | *Bothrocophias\_colombianus* | 44.3 | 1 | 42.1 | 0 | 0 | 5.7 | 0.1 | 0 | 5.6 | 0.8 | 0.1255 | 1275.3 | 165.00 | 42.00 | 0.44 | 2343.02 | M |
| Viperidae | *Bothrops\_alternatus* | 2 | 5.8 | 52.2 | 0 | 0 | 14.9 | 2.5 | 14.8 | 0 | 0 | 0.1627 | 2399.7 | 184.36 | 26.97 | 7.68 | 1729.85 | M |
| Viperidae | *Bothrops\_asper* | 45.5 | 4.4 | 44 | 0 | 0 | 4.6 | 0.1 | 0.5 | 1.4 | 0 | 0.1131 | 7499 | 246.89 | 53.17 | 3.06 | 2122.52 | M |
| Viperidae | *Bothrops\_atrox* | 8.1 | 2.3 | 85 | 0 | 0 | 1.35 | 3.3 | 0 | 0 | 0 | 0.0283 | 1803.4 | 253.07 | 45.46 | 5.37 | 2244.79 | M |
| Viperidae | *Bothrops\_ayerbei* | 0.7 | 9.3 | 53.7 | 0 | 0 | 3.3 | 1.1 | 10.1 | 2.3 | 8.3 | 0.1666 | 1044.9 | 121.00 | 36.00 | 0.61 | 1840.94 | M |
| Viperidae | *Bothrops\_barnetti* | 6.4 | 6.7 | 74.1 | 0 | 0 | 0.8 | 3.1 | 3.3 | 5.5 | 0 | 0.0598 | 1387.5 | 248.67 | 108.33 | 4.47 | 1000.66 | M |
| Viperidae | *Bothrops\_caribbaeus* | 12.8 | 4.7 | 68.6 | 0 | 0 | 8.4 | 2.6 | 0 | 1.7 | 0 | 0.0778 | 3917.4 | 249.40 | 38.00 | 3.66 | 2246.78 | I |
| Viperidae | *Bothrops\_cotiara* | 0.6 | 13 | 51 | 0 | 0 | 19.6 | 2.9 | 4.7 | 0 | 0 | 0.1646 | 521.2 | 179.70 | 28.96 | 4.08 | 1989.65 | M |
| Viperidae | *Bothrops\_diporus* | 24.1 | 7.2 | 34.2 | 0 | 0 | 7.4 | 0 | 2.9 | 1.4 | 15.9 | 0.2847 | 687.8 | 198.60 | 45.33 | 7.15 | 1552.21 | M |
| Viperidae | *Bothrops\_erythromelas* | 12.6 | 6.85 | 46.2 | 0 | 0 | 0 | 0.4 | 15 | 6.15 | 11.9 | 0.2033 | 324.8 | 235.63 | 70.00 | 5.46 | 1274.80 | M |
| Viperidae | *Bothrops\_fonsecai* | 30.1 | 4.1 | 42.5 | 0 | 0 | 1.9 | 2.4 | 9.8 | 4.4 | 0 | 0.1926 | 650.3 | 172.44 | 66.78 | 1.90 | 1933.92 | M |
| Viperidae | *Bothrops\_insularis* | 10 | 12.5 | 30 | 0 | 0 | 1.3 | 1.3 | 31.3 | 0 | 11.3 | 0.2624 | 843.7 | 183.00 | 58.00 | 3.28 | 2259.34 | I |
| Viperidae | *Bothrops\_jararaca* | 20.2 | 28.6 | 10.3 | 0 | 0 | 8 | 2.6 | 9.4 | 0.2 | 22.6 | 0.3073 | 2046.4 | 194.49 | 36.94 | 3.74 | 1878.37 | M |
| Viperidae | *Bothrops\_jararacussu* | 25.7 | 12.3 | 26.2 | 0 | 0 | 15 | 2.2 | 9.7 | 0 | 0 | 0.3452 | 5169.5 | 206.40 | 37.32 | 4.08 | 1946.99 | M |
| Viperidae | *Bothrops\_lanceolatus* | 8.6 | 14.4 | 74.2 | 0 | 0 | 2.8 | 0 | 0.1 | 0 | 0 | 0.0558 | 3917.4 | 243.68 | 39.14 | 2.76 | 2226.05 | I |
| Viperidae | *Bothrops\_neuwiedi* | 8.4 | 8.8 | 49.9 | 0 | 0 | 16.7 | 2 | 8.6 | 0 | 0 | 0.1799 | 521.2 | 201.62 | 51.64 | 7.94 | 1640.58 | M |
| Viperidae | *Bothrops\_pauloensis* | 31.9 | 10.5 | 38.1 | 0 | 0 | 2.8 | 2.2 | 0.6 | 1.3 | 12.4 | 0.2030 | 470 | 204.42 | 63.73 | 4.34 | 1841.34 | M |
| Viperidae | *Bothrops\_pictus* | 14.1 | 7.7 | 68 | 0 | 0 | 0 | 0 | 1.1 | 8.9 | 0 | 0.0781 | 117.9 | 178.20 | 96.80 | 0.90 | 562.74 | M |
| Viperidae | *Bothrops\_pirajai* | 40.2 | 7.1 | 20.7 | 0 | 0 | 5.2 | 0 | 9.2 | 1.4 | 5.6 | 0.2665 | 1302.7 | 231.00 | 16.00 | 4.19 | 1914.16 | M |
| Viperidae | *Bothrops\_punctatus* | 9.3 | 5.4 | 41.5 | 0 | 0 | 3.1 | 1.2 | 16.7 | 3.8 | 10.7 | 0.2639 | 1387.5 | 230.64 | 31.61 | 2.49 | 2323.76 | M |
| Elapidae | *Bungarus\_caeruleus* | 64.5 | 0 | 1.3 | 4.4 | 19 | 0 | 5.5 | 0 | 0 | 0 | 0.0913 | 970.5 | 257.76 | 111.29 | 5.02 | 1753.65 | M |
| Elapidae | *Bungarus\_candidus* | 25.2 | 3.9 | 4.9 | 12.6 | 30.1 | 5.8 | 3.9 | 0 | 0 | 1 | 0.3531 | 782.2 | 253.98 | 59.17 | 2.18 | 2137.06 | M |
| Elapidae | *Bungarus\_fasciatus* | 66.8 | 0 | 3.5 | 1.8 | 1.3 | 7 | 0.4 | 0 | 0 | 0 | 0.0929 | 1777.1 | 239.50 | 74.28 | 3.90 | 2128.59 | M |
| Viperidae | *Cerastes\_cerastes* | 16.6 | 13.2 | 55.9 | 0 | 0 | 6.2 | 0 | 3.2 | 4.9 | 0 | 0.1340 | 371.3 | 231.47 | 87.32 | 5.18 | 323.59 | M |
| Viperidae | *Cerrophidion\_godmani* | 23.4 | 19.1 | 32.8 | 0 | 0 | 5 | 4.2 | 0.5 | 7.5 | 5.7 | 0.2859 | 294.2 | 187.26 | 75.52 | 1.35 | 2008.46 | M |
| Viperidae | *Cerrophidion\_sasai* | 23.4 | 19.1 | 32.8 | 0 | 0 | 5 | 4.2 | 0.5 | 7.5 | 5.7 | 0.2859 | 194.8 | 186.00 | 52.83 | 1.42 | 2168.68 | M |
| Viperidae | *Crotalus\_adamanteus* | 7.8 | 20 | 24.4 | 0 | 0 | 5.3 | 1.3 | 22.2 | 0 | 0 | 0.3364 | 7630.7 | 207.16 | 39.45 | 25.66 | 1807.17 | M |
| Viperidae | *Crotalus\_atrox* | 7.9 | 19.8 | 24.4 | 0 | 0 | 8 | 4.3 | 3.4 | 6.2 | 3 | 0.5688 | 6163.1 | 199.83 | 50.33 | 23.21 | 916.16 | M |
| Viperidae | *Crotalus\_basiliscus* | 14 | 11 | 49.7 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.1971 | 4179.4 | 231.75 | 109.76 | 3.44 | 1411.09 | M |
| Viperidae | *Crotalus\_culminatus* | 8.3 | 10.1 | 68 | 0 | 0 | 2.7 | 1.9 | 0 | 0 | 1.6 | 0.0654 | 2358.6 | 225.90 | 103.08 | 1.43 | 1537.60 | M |
| Viperidae | *Crotalus\_durissus\_cascavella* | 90.9 | 1.2 | 0.1 | 0 | 0 | 0.1 | 0.9 | 0.1 | 0.2 | 0 | 0.0161 | 2883 | 258.00 | 69.00 | 5.98 | 1154.77 | M |
| Viperidae | *Crotalus\_durissus\_collilineatus* | 72 | 1.9 | 0.4 | 0 | 0 | 0.5 | 1.8 | 0.1 | 0.5 | 0 | 0.0598 | 2883 | 219.89 | 68.89 | 4.57 | 1877.83 | M |
| Viperidae | *Crotalus\_durissus\_terrificus* | 48.5 | 25.3 | 3.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1788 | 2883 | 209.06 | 58.21 | 7.28 | 1662.41 | M |
| Viperidae | *Crotalus\_simus* | 22.4 | 30.4 | 27.4 | 0 | 0 | 5.7 | 1 | 0.6 | 1.5 | 6.5 | 0.2642 | 2883 | 246.34 | 80.58 | 3.38 | 1869.48 | M |
| Viperidae | *Crotalus\_tigris* | 0 | 26.8 | 66.2 | 0 | 0 | 0 | 1.9 | 0 | 0.2 | 0 | 0.0738 | 396.1 | 198.01 | 72.01 | 6.61 | 629.31 | M |
| Viperidae | *Crotalus\_tzabcan* | 11.1 | 5.4 | 18.5 | 0 | 0 | 0.5 | 0 | 35.2 | 0 | 4.2 | 0.2570 | 1883.4 | 254.80 | 64.55 | 9.74 | 1566.05 | M |
| Viperidae | *Daboia\_deserti* | 5.5 | 8.3 | 45.4 | 2.5 | 0 | 0 | 0 | 8.1 | 13.8 | 4.5 | 0.2349 | 2046.4 | 191.00 | 62.00 | 2.08 | 219.66 | M |
| Viperidae | *Daboia\_russelii\_India* | 32.5 | 8 | 24.8 | 12.5 | 0 | 0.3 | 6.8 | 1.8 | 4.9 | 0 | 0.3139 | 3122.3 | 258.29 | 99.00 | 4.45 | 1817.43 | M |
| Viperidae | *Daboia\_russelii\_Sri\_Lanka* | 35 | 16 | 6.9 | 4.6 | 0 | 5.2 | 2 | 22.4 | 0 | 0 | 0.2924 | 3122.3 | 258.29 | 99.00 | 4.45 | 1817.43 | I |
| Elapidae | *Dendroaspis\_angusticeps* | 0 | 0 | 6.7 | 16.3 | 69.2 | 0 | 2 | 0 | 0 | 0 | 0.0738 | 2290 | 221.28 | 57.03 | 5.14 | 1480.44 | M |
| Elapidae | *Dendroaspis\_polylepis* | 0 | 0 | 3.2 | 61.1 | 31 | 0 | 0 | 0 | 0 | 2.9 | 0.0863 | 8213.6 | 209.28 | 78.70 | 4.86 | 1120.84 | M |
| Elapidae | *Drysdalia\_coronoides* | 0 | 0 | 0 | 9.2 | 86.4 | 0 | 2.8 | 0 | 0 | 0 | 0.0249 | 36.9 | 118.44 | 23.98 | 2.11 | 1358.81 | I |
| Viperidae | *Echis\_carinatus* | 7.97 | 4.58 | 56.57 | 0 | 0 | 1.19 | 1.99 | 16.53 | 7.7 | 0 | 0.1354 | 272.3 | 256.33 | 102.39 | 5.88 | 996.71 | M |
| Viperidae | *Echis\_coloratus* | 5.7 | 3.58 | 61.41 | 0 | 0 | 3.91 | 5.69 | 9.45 | 5.8 | 0 | 0.1160 | 383.6 | 230.87 | 91.06 | 2.23 | 379.92 | M |
| Viperidae | *Echis\_ocellatus* | 8.5 | 1.71 | 72.43 | 0 | 0 | 1.36 | 0.34 | 6.46 | 0 | 0 | 0.0663 | 162.5 | 272.60 | 83.53 | 5.92 | 1571.96 | M |
| Viperidae | *Echis\_pyramidum* | 21.57 | 1.42 | 48.94 | 0 | 0 | 2.83 | 0 | 24.26 | 0 | 0 | 0.1455 | 324.8 | 267.60 | 97.40 | 4.88 | 803.25 | M |
| Viperidae | *Lachesis\_acrochorda* | 2.3 | 35.1 | 23.2 | 0 | 0 | 9.6 | 0.9 | 6.9 | 0 | 21.5 | 0.2465 | 12747.4 | 249.63 | 36.21 | 1.71 | 2382.68 | M |
| Viperidae | *Lachesis\_melanocephala* | 13.4 | 21 | 18.9 | 0 | 0 | 3.6 | 0 | 7.5 | 0 | 30.2 | 0.3157 | 27352.6 | 241.80 | 58.20 | 1.27 | 2460.17 | M |
| Viperidae | *Lachesis\_muta* | 8.7 | 31.2 | 31.9 | 0 | 0 | 2.7 | 1.8 | 7.9 | 0 | 14.7 | 0.2496 | 21669.1 | 249.41 | 42.77 | 5.34 | 2144.77 | M |
| Viperidae | *Lachesis\_muta\_rhombeata* | 10.8 | 26.5 | 29.5 | 0 | 0 | 0.5 | 1.4 | 2.7 | 0 | 28 | 0.2329 | 21669.1 | 248.00 | 60.00 | 3.12 | 1872.32 | M |
| Viperidae | *Lachesis\_stenophrys* | 14.1 | 21.2 | 30.6 | 0 | 0 | 2.7 | 0 | 3.6 | 0 | 27.1 | 0.2519 | 27352.6 | 245.10 | 40.25 | 2.81 | 2355.57 | M |
| Elapidae | *Laticauda\_colubrina* | 33.3 | 0 | 0 | 0 | 66.1 | 0 | 0.05 | 0 | 0 | 0 | 0.0635 | 586.9 | 258.30 | 46.58 | 2.27 | 2417.71 | M |
| Viperidae | *Macrovipera\_lebetina\_obtusa* | 14.6 | 14.9 | 32.1 | 0 | 0 | 1.7 | 2.6 | 14.8 | 11.3 | 5.3 | 0.3389 | 4769.8 | 146.11 | 71.06 | 3.80 | 669.43 | M |
| Elapidae | *Micropechis\_ikaheka* | 80 | 0.1 | 7.6 | 0.7 | 9.2 | 0.4 | 1.8 | 0 | 0 | 0 | 0.0406 | 1338.4 | 230.16 | 25.63 | 2.18 | 2463.01 | I |
| Elapidae | *Micrurus\_alleni* | 10.9 | 0 | 1.2 | 0 | 77.3 | 0 | 0 | 0 | 0 | 0 | 0.0493 | 510.4 | 246.14 | 47.75 | 2.85 | 2364.67 | M |
| Elapidae | *Micrurus\_altirostris* | 13.7 | 0 | 0.9 | 2.1 | 79.5 | 0 | 0.1 | 0 | 0 | 0 | 0.0412 | 483.4 | 190.07 | 12.69 | 4.60 | 1952.86 | M |
| Elapidae | *Micrurus\_clarki* | 36.5 | 1 | 1.6 | 0.9 | 48.2 | 3.8 | 0 | 0 | 0 | 0 | 0.1324 | 162.1 | 237.73 | 51.73 | 1.37 | 2357.28 | M |
| Elapidae | *Micrurus\_corallinus* | 11.9 | 0.8 | 2.9 | 0 | 81.7 | 0 | 0 | 0 | 0 | 0 | 0.0358 | 244.5 | 213.05 | 41.04 | 4.10 | 1884.59 | M |
| Elapidae | *Micrurus\_dumerilii* | 52 | 1.9 | 1.8 | 9 | 28.1 | 0 | 0 | 0 | 0 | 0 | 0.1379 | 221.9 | 237.17 | 42.67 | 2.59 | 2087.37 | M |
| Elapidae | *Micrurus\_fulvius* | 64.9 | 0 | 2.9 | 2.2 | 25.1 | 0 | 0 | 0 | 0 | 0 | 0.0815 | 401.7 | 206.13 | 41.94 | 24.73 | 1725.60 | M |
| Elapidae | *Micrurus\_mipartitus* | 29 | 1.3 | 1.6 | 1.9 | 61.1 | 4 | 0 | 0 | 0 | 0 | 0.0904 | 338.7 | 213.79 | 41.98 | 1.77 | 2058.40 | M |
| Elapidae | *Micrurus\_mosquitensis* | 55.6 | 0.5 | 2.6 | 9.8 | 22.5 | 0 | 0 | 0 | 0 | 0 | 0.1309 | 126.3 | 231.66 | 40.40 | 2.64 | 2205.84 | M |
| Elapidae | *Micrurus\_multifasciatus* | 8.2 | 0 | 3.6 | 1.9 | 83 | 0 | 0 | 0 | 0 | 0 | 0.0334 | 338.7 | 242.25 | 47.58 | 2.09 | 2282.00 | M |
| Elapidae | *Micrurus\_nigrocinctus* | 48 | 0.7 | 4.3 | 0 | 38 | 0 | 0 | 0 | 0 | 0 | 0.1273 | 353.3 | 237.21 | 64.68 | 1.79 | 2159.36 | M |
| Elapidae | *Micrurus\_tschudii* | 4.1 | 0 | 0 | 1.6 | 95.2 | 0 | 0 | 0 | 0 | 0 | 0.0078 | 185.5 | 201.95 | 119.30 | 2.57 | 951.33 | M |
| Viperidae | *Montivipera\_raddei* | 23.8 | 8.4 | 31.6 | 0.9 | 0 | 0.2 | 7.4 | 9.6 | 9.7 | 6 | 0.3239 | 687.8 | 54.50 | 44.88 | 1.60 | 774.03 | M |
| Elapidae | *Naja\_atra\_China* | 12.2 | 0 | 1.6 | 0 | 84.3 | 0 | 1.8 | 0 | 0 | 0 | 0.0290 | 842.3 | 242.00 | 60.00 | 5.11 | 2091.98 | M |
| Elapidae | *Naja\_atra\_Taiwan* | 15.5 | 0 | 2.3 | 0 | 78 | 0.2 | 2.3 | 0 | 0 | 0 | 0.0445 | 842.3 | 151.00 | 63.00 | 0.90 | 1945.54 | I |
| Elapidae | *Naja\_haje* | 4 | 0 | 9 | 1.9 | 60 | 1 | 10 | 0 | 0 | 0 | 0.1254 | 2516.8 | 258.98 | 78.14 | 5.79 | 1452.30 | M |
| Elapidae | *Naja\_kaouthia\_Thailand* | 12.2 | 0 | 2.6 | 0 | 78.3 | 1 | 2.3 | 0 | 0 | 0.2 | 0.0453 | 1873.6 | 280.00 | 82.00 | 6.21 | 1621.28 | M |
| Elapidae | *Naja\_katiensis* | 29 | 0 | 3.3 | 0 | 67.1 | 0 | 0.2 | 0 | 0 | 0 | 0.0667 | 567.2 | 273.50 | 161.50 | 10.03 | 763.57 | M |
| Elapidae | *Naja\_melanoleuca* | 12.9 | 0 | 9.7 | 3.8 | 57.1 | 0 | 7.6 | 0 | 0 | 0 | 0.1372 | 2756.1 | 254.49 | 69.92 | 5.10 | 1767.43 | M |
| Elapidae | *Naja\_mossambica* | 27.1 | 0 | 2.6 | 0 | 69.3 | 0 | 0 | 0 | 0 | 0 | 0.0618 | 669.7 | 201.59 | 75.51 | 4.54 | 1116.02 | M |
| Elapidae | *Naja\_naja\_Eastern\_India* | 11.4 | 0.3 | 1 | 0.4 | 63.8 | 0.8 | 2.1 | 0 | 0 | 2 | 0.1058 | 1683.5 | 247.96 | 92.69 | 4.37 | 1813.05 | M |
| Elapidae | *Naja\_naja\_Sri\_Lanka* | 14 | 0 | 0.9 | 0 | 80.5 | 0 | 3.7 | 0 | 0 | 0 | 0.0380 | 1683.5 | 247.96 | 92.69 | 4.37 | 1813.05 | I |
| Elapidae | *Naja\_nigricollis* | 21.9 | 0 | 2.4 | 0 | 73.2 | 0 | 0.2 | 0 | 0 | 0 | 0.0547 | 2756.1 | 250.88 | 82.30 | 5.18 | 1523.36 | M |
| Elapidae | *Naja\_nubiae* | 26.4 | 0 | 2.6 | 0 | 70.9 | 0 | 0 | 0 | 0 | 0 | 0.0573 | 648.4 | 238.40 | 24.80 | 2.88 | 81.59 | M |
| Elapidae | *Naja\_pallida* | 30.1 | 0 | 1.6 | 0 | 67.7 | 0 | 0 | 0 | 0 | 0 | 0.0631 | 669.7 | 249.05 | 85.84 | 4.88 | 1210.59 | M |
| Elapidae | *Naja\_sputatrix* | 31.2 | 0.4 | 1.3 | 0.2 | 64.2 | 0.1 | 0 | 0 | 0 | 0 | 0.0740 | 538.4 | 245.63 | 47.74 | 1.88 | 2160.94 | I |
| Elapidae | *Notechis\_scutatus* | 74.5 | 5.9 | 0 | 6.9 | 5.6 | 0 | 0.3 | 0 | 0 | 2 | 0.0588 | 1338.4 | 135.95 | 26.88 | 2.82 | 1330.14 | M |
| Elapidae | *Ophiophagus\_hannah* | 2.8 | 0 | 11.9 | 3.3 | 64.5 | 0.5 | 6.5 | 0 | 0 | 0.2 | 0.0994 | 17723.3 | 240.79 | 72.31 | 3.72 | 2133.82 | M |
| Elapidae | *Oxyuranus\_scutellatus* | 74 | 5 | 7 | 10 | 4.5 | 0 | 1 | 0 | 0 | 1 | 0.0587 | 4665.5 | 234.31 | 77.93 | 4.65 | 1863.90 | M |
| Viperidae | *Porthidium\_lansbergii* | 16.2 | 4.5 | 35.5 | 0 | 0 | 3.6 | 1.4 | 6.7 | 12.9 | 12.4 | 0.3231 | 383.6 | 258.97 | 60.09 | 2.50 | 1884.15 | M |
| Viperidae | *Porthidium\_nasutum* | 11.6 | 9.6 | 52.1 | 0 | 0 | 3 | 1.3 | 10.4 | 9.9 | 1.9 | 0.1664 | 139 | 243.58 | 41.56 | 2.67 | 2283.19 | M |
| Viperidae | *Porthidium\_ophryomegas* | 13.5 | 7.3 | 45 | 0 | 0 | 3.3 | 0.6 | 8 | 16.7 | 4.2 | 0.2153 | 272.3 | 253.44 | 79.01 | 3.09 | 2097.35 | M |
| Elapidae | *Pseudechis\_papuanus* | 90.2 | 0 | 2.8 | 0 | 3.1 | 1.6 | 2.3 | 0 | 0 | 0 | 0.0173 | 2160 | 262.71 | 58.29 | 4.37 | 2233.19 | I |
| Viperidae | *Sistrurus\_miliarius* | 32.5 | 17.1 | 36.1 | 0 | 0 | 2.1 | 2.9 | 0 | 7.7 | 0 | 0.2055 | 275.2 | 193.81 | 34.96 | 32.12 | 1746.89 | M |
| Elapidae | *Toxicocalamus\_longissimus* | 6.5 | 0 | 1.4 | 0 | 92.1 | 0 | 0 | 0 | 0 | 0 | 0.0133 | 89.5 | 264.40 | 14.40 | 1.26 | 2098.25 | I |
| Viperidae | *Vipera\_anatolica* | 8.1 | 1.6 | 41.5 | 0.3 | 0 | 0 | 15.9 | 1.1 | 2 | 0 | 0.2986 | 51 | 72.00 | 63.00 | 0.70 | 1119.21 | M |
| Viperidae | *Vipera\_berus* | 10 | 31 | 19 | 0 | 0 | 2 | 8 | 2 | 1 | 11 | 0.3991 | 227.4 | 68.83 | 25.05 | 43.34 | 1156.42 | M |
| Viperidae | *Vipera\_kaznakovi* | 41 | 11 | 16 | 0 | 0 | 4 | 10 | 12 | 0.53 | 0 | 0.2526 | 184.6 | 113.54 | 24.54 | 1.33 | 1792.66 | M |
| Viperidae | *Vipera\_nikolskii* | 65 | 19 | 0.66 | 0 | 0 | 0.08 | 0.66 | 4 | 0 | 0 | 0.0879 | 227.4 | 59.42 | 29.26 | 30.37 | 940.29 | M |
| Viperidae | *Vipera\_orlovi* | 24 | 24 | 15 | 0.15 | 0 | 5 | 12 | 11 | 0.56 | 0 | 0.3800 | 148.8 | 120.00 | 21.00 | 2.71 | 1328.41 | M |
| Viperidae | *Vipera\_renardi* | 44 | 8 | 12 | 0.8 | 0 | 4 | 8 | 3 | 13 | 0 | 0.2420 | 192.4 | 59.14 | 24.84 | 24.01 | 820.51 | M |

**Table S2.** List of GenBank accession numbers for 3 outgroup taxa, 37 elapid species and 70 viperid species. Names in red represent the seven species with no genetic data found.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Taxa** | **12S** | **16S** | **CYTB** | **ND2** | **ND4** |
| **OUTGROUPS** |  |  |  |  |  |
| *Iguana iguana* | AB028742.1 | AB028756.1 | KX610608.1 | -- | AF217782.1 |
| *Rena humilis* | GQ469228.1 | AB079597 | AY099991.1 | AB079597.1 | AB079597 |
| *Boa constrictor* | AB177354 | AB177354 | AB177354 | NC\_007398.1 | AB177354 |
| **ELAPIDAE** |  |  |  |  |  |
| *Austrelaps labialis* | EU547126.1 | EU547175.1 | EU547077.1 | -- | EU547029.1 |
| *Bungarus caeruleus* | -- | -- | AJ749305.1 | -- | AJ830220.1 |
| *Bungarus candidus* | JN687932.1 | JN687933.1 | AJ565001.1 | JN123449.1 | AJ830234.1 |
| *Bungarus fasciatus* | EU579523 | EU579523 | EU579523 | AY058997.1 | EU579523 |
| *Dendroaspis angusticeps* | AF544764.1 | FJ404194.1 | -- | -- | JF357927.1 |
| *Dendroaspis polylepis* | -- | -- | FJ404295.1 | AY059003.1 | AY058974.1 |
| *Drysdalia coronoides* | U96796.1 | EU547173.1 | EU547075.1 | -- | GU062880.1 |
| *Laticauda colubrina* | U96799.1 | EU547138.1 | EU547040.1 | AY058993.1 | FJ606513.1 |
| *Micropechis ikaheka* | GQ397243.1 | FJ587207.1 | EU547042.1 | -- | GQ397208.1 |
| *Micrurus alleni* | -- | -- | -- | -- | KX660566.1 |
| *Micrurus altirostris* | -- | JQ627286.1 | -- | -- | AF228429.1 |
| *Micrurus clarki* | -- | -- | -- | -- | -- |
| *Micrurus corallinus* | -- | -- | -- | -- | JF308715.1 |
| *Micrurus dumerilii* | -- | -- | -- | -- | KP998029.1 |
| *Micrurus fulvius* | U96805.1 | GU045453 | U69846.1 | AY059006.1 | GU045453 |
| *Micrurus mipartitus* | -- | -- | EF137414.1 | -- | EF137406.1 |
| *Micrurus mosquitensis* | -- | -- | -- | -- | JF308712.1 |
| *Micrurus multifasciatus* | -- | -- | -- | -- | -- |
| *Micrurus nigrocinctus* | -- | MH140868.1 | KU754344.1 | -- | KU754421.1 |
| *Micrurus tschudii* | -- | -- | -- | -- | -- |
| *Naja atra* | EU913475.1 | EU913475 | EU913475 | DQ302759.1 | EU913475 |
| *Naja haje* | GQ359664.1 | GQ359747.1 | GQ359501.1 | -- | GQ359580.1 |
| *Naja kaouthia* | JN687924.1 | GQ359757.1 | FR693728.1 | AY059008.1 | EU624209.1 |
| *Naja katiensis* | GQ359657.1 | GQ359743.1 | GQ359494.1 | -- | DQ897707.1 |
| *Naja melanoleuca* | U96801.1 | JF357949.1 | FR693726.1 | -- | DQ897689.1 |
| *Naja mossambica* | GQ359658.1 | GQ359744.1 | GQ359495.1 | -- | DQ897727.1 |
| *Naja naja* | DQ343648.1 | DQ343648 | DQ343648 | DQ343648.1 | DQ343648 |
| *Naja nigricincta* | -- | -- | DQ897752.1 | -- | DQ897709.1 |
| *Naja nigricollis* | EU624237.1 | GQ359754.1 | GQ359505.1 | -- | DQ897697.1 |
| *Naja nivea* | EU624238.1 | GQ359755.1 | FR693729.1 | AY059009.1 | AY058983.1 |
| *Naja nubiae* | GQ359660.1 | GQ359746.1 | GQ359497.1 | -- | GQ359579.1 |
| *Naja pallida* | GQ359659.1 | GQ359745.1 | FR693723.1 | -- | GQ359578.1 |
| *Naja sputatrix* | -- | -- | DQ897734.1 | -- | DQ897691.1 |
| *Notechis scutatus* | U96802.1 | EU547180.1 | EU547082.1 | AY058994.1 | EU547034.1 |
| *Ophiophagus hannah* | EU921899.1 | JN687931.1 | EU921899 | AY059002.1 | EU921899 |
| *Oxyuranus scutellatus* | EU547100.1 | EU547149.1 | EU547051.1 | -- | EF210827.1 |
| *Pseudechis papuanus* | AJ749354.1 | AJ749373.1 | AY340144.1 | -- | AY340173.1 |
| *Toxicocalamus longissimus* | -- | KT968675.1 | KT778523.1 | -- | KU128805.1 |
| **VIPERIDAE** |  |  |  |  |  |
| *Agkistrodon bilineatus* | AF057230.1 | AF057277.1 | EU483408.1 | -- | AF156583.1 |
| *Atropoides nummifer* | DQ305422.1 | DQ305445.1 | EU684273.1 | -- | DQ061220.1 |
| *Atropoides picadoi* | AF057208.1 | AF057255.1 | AY220324.1 | -- | AY220347.1 |
| *Bitis arietans* | GQ359655.1 | GQ359736.1 | GQ359487.1 | JX073288.1 | GQ359574.1 |
| *Bitis caudalis* | EU624247.1 | EU624282.1 | AJ275693.1 | JX073293.1 | EU624215.1 |
| *Bitis gabonica* | EU624249.1 | EU624284.1 | AJ275695.1 | JX073296.1 | EU624217.1 |
| *Bitis nasicornis* | DQ305411.1 | AY188048.1 | DQ305457.1 | -- | DQ305475.1 |
| *Bitis rhinoceros* | EU624250.1 | EU624285.1 | AJ275696.1 | -- | EU624218.1 |
| *Bothriechis aurifer* | DQ305425.1 | DQ305448.1 | DQ305466.1 | -- | DQ305483.1 |
| *Bothriechis bicolor* | DQ305426.1 | DQ305449.1 | DQ305467.1 | -- | DQ305484.1 |
| *Bothriechis lateralis* | AF057211.1 | AF057258.1 | AY223588.1 | -- | U41873.1 |
| *Bothriechis marchi* | DQ305428.1 | DQ305451.1 | DQ305469.1 | -- | DQ305486.1 |
| *Bothriechis nigroviridis* | AF057212.1 | AF057259.1 | AY223589.1 | -- | AY223635.1 |
| *Bothriechis schlegelii* | KC847270.1 | KC847257.1 | KC847272.1 | -- | KC847285.1 |
| *Bothriechis supraciliaris* | DQ305429.1 | DQ305452.1 | DQ305470.1 | -- | DQ305487.1 |
| *Bothriechis thalassinus* | DQ305424.1 | DQ305447.1 | DQ305465.1 | -- | DQ305482.1 |
| *Bothrocophias campbelli* | -- | -- | AF191582.1 | -- | AF292622.1 |
| *Bothrocophias colombianus* | -- | -- | -- | -- | -- |
| *Bothrops alternatus* | EU867251.1 | EU867261.1 | EU867273.1 | -- | EU867285.1 |
| *Bothrops asper* | EU624239.1 | GQ372868.1 | FJ985697.1 | -- | EU624210.1 |
| *Bothrops atrox* | GQ428495.1 | GQ428470.1 | AY223598.1 | -- | GQ428485.1 |
| *Bothrops ayerbei* | -- | -- | -- | -- | -- |
| *Bothrops barnetti* | -- | -- | -- | -- | -- |
| *Bothrops caribbaeus* | -- | -- | AF292598.1 | -- | AF292636.1 |
| *Bothrops cotiara* | AF057217.1 | AF057264.1 | AY223597.1 | -- | AF292619.1 |
| *Bothrops diporus* | DQ305431.1 | DQ305454.1 | DQ305472.1 | -- | DQ305489.1 |
| *Bothrops erythromelas* | AF057219.1 | AF057266.1 | AY223600.1 | -- | U41877.1 |
| *Bothrops fonsecai* | -- | -- | AF292580.1 | -- | AF292618.1 |
| *Bothrops insularis* | AF057216.1 | AF057263.1 | AY223596.1 | -- | AF188705.1 |
| *Bothrops jararaca* | EU867254.1 | EU867266.1 | EU867278.1 | -- | AF292627.1 |
| *Bothrops jararacussu* | AY223661.1 | AY223674.1 | AY223602.1 | -- | AY223643.1 |
| *Bothrops lanceolatus* | -- | -- | AF292599.1 | -- | AF292637.1 |
| *Bothrops neuwiedi* | -- | JQ627282.1 | KF801178.1 | -- | AF292624.1 |
| *Bothrops pauloensis* | EU867260.1 | EU867272.1 | EU867284.1 | -- | EU867296.1 |
| *Bothrops pictus* | -- | -- | AF292583.1 | -- | AF292621.1 |
| *Bothrops pirajai* | MN296334.1 | MN296348.1 | MN296446.1 | -- | MN296457.1 |
| *Bothrops punctatus* | -- | -- | AF292594.1 | -- | AF292632.1 |
| *Cerastes cerastes* | HQ658427.1 | HQ267811.1 | AF471028.1 | -- | EU624222.1 |
| *Cerrophidion godmani* | EU684303.1 | DQ305442.1 | AY220328.1 | -- | AY220349.1 |
| *Cerrophidion sasai* | -- | -- | -- | -- | -- |
| *Crotalus adamanteus* | AF259255.1 | AF259147.1 | JN620809.1 | -- | JN620959.1 |
| *Crotalus atrox* | AF259256.1 | AF259148.1 | JN620811.1 | AY016239.1 | JN620961.1 |
| *Crotalus basiliscus* | AF259244.1 | AF259136.1 | AY704844.1 | AY704796.1 | AY704894.1 |
| *Crotalus culminatus* | -- | -- | AY704831.1 | -- | AY704881.1 |
| *Crotalus durissus* | AF259248.1 | AF259140.1 | AY704826.1 | AY704790.1 | AY704876.1 |
| *Crotalus simus* | EU624240.1 | GQ372869.1 | HE867034.1 | -- | -- |
| *Crotalus tigris* | AF259249.1 | AF259141.1 | JN620818.1 | AY016240.1 | JN620968.1 |
| *Crotalus tzabcan* | -- | -- | AY704806.1 | -- | AY704856.1 |
| *Daboia deserti* | -- | AJ275765.1 | AJ275712.1 | -- | -- |
| *Daboia russelii* | EU913478 | EU913478 | EU913478 | NC\_011391.1 | EU913478 |
| *Echis carinatus* | GQ359604.1 | GQ359685.1 | GQ359436.1 | -- | GQ359524.1 |
| *Echis coloratus* | GQ359628.1 | GQ359712.1 | GQ359462.1 | -- | GQ359547.1 |
| *Echis ocellatus* | GQ359594.1 | GQ359676.1 | GQ359426.1 | -- | GQ359515.1 |
| *Echis pyramidum* | GQ359611.1 | GQ359694.1 | GQ359445.1 | -- | GQ359530.1 |
| *Lachesis acrochorda* | JN870187.1 | JN870197.1 | JN870204.1 | -- | JN870212.1 |
| *Lachesis melanocephala* | -- | -- | U96018.1 | -- | U96028.1 |
| *Lachesis muta* | AF057221.1 | AF057268.1 | AY223604.1 | MK313483.1 | U41885.1 |
| *Lachesis muta rhombeata* | MK313327.1 | -- | U96017.1 | -- | U96027.1 |
| *Lachesis stenophrys* | AF057220.1 | AF057267.1 | AY223603.1 | -- | U96026.1 |
| *Macrovipera lebetina* | EU624260.1 | EU624294.1 | AJ275713.1 | -- | DQ897729.1 |
| *Montivipera raddei* | -- | AJ275784.1 | AJ275730.1 | -- | -- |
| *Porthidium lansbergii* | AY223655.1 | AY223668.1 | AY223582.1 | -- | AY223631.1 |
| *Porthidium nasutum* | AF057204.1 | AF057251.1 | DQ061210.1 | -- | DQ061235.1 |
| *Porthidium ophryomegas* | AF057205.1 | AF057252.1 | DQ061216.1 | -- | DQ061241.1 |
| *Sistrurus miliarius* | AF057228.1 | AF259120.1 | EU483385.1 | GQ359815.1 | U41889.1 |
| *Vipera anatolica* | -- | -- | KX865130.1 | -- | -- |
| *Vipera berus* | EU543221.1 | DQ186081.1 | KC176730.1 | AY321075.1 | EU624233.1 |
| *Vipera kaznakovi* | -- | -- | KC176736.1 | -- | FR727034.1 |
| *Vipera\_nikolskii* | EU543220.1 | KX694673.1 | KX694843.1 | EU625372.1 | LT221005.1 |
| *Vipera orlovi* | -- | -- | KC176746.1 | -- | -- |
| *Vipera renardi* | -- | -- | KC176729.1 | -- | FR727033.1 |

**Table S3.**  List of fossils that were used as priors for calibrating divergence times, maximum (Max\_Ma) and minimum estimated stratigraphic age (Min\_Ma). Given in parentheses are the parameters of the priors distributions, this is the mean (in real space), and the standard deviation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Calibration** | **Fossil** | **Max\_Ma** | **Min\_Ma** | **Prior** | **Reference** |
| Boidae | Boidae indet | 83.6 | 72.1 | Normal (77.8, 7.8) | Laurent et al. 2001 |
| Scolecophidia | Scolecophidia indet | 59.2 | 56 | Normal (57.6, 5.8) | Auge & Rage, 2006 |
| Elapidae | Elapidae indet | 55.8 | 48.6 | Normal (52.2, 5.2) | George & Vicent, 1977 |
| Viperinae | Viperinae indet | 23.03 | 20.44 | Normal (21.7, 2.2) | Szyndlar & Rage, 1999 |
| Crotalinae | Crotalinae indet | 20.43 | 15.97 | Normal (18.2, 1.8) | Holman 1998 |

**Table S4.** Phylogenetic Path Analysis summary. Phopolispases A2 (PLA2); snake venom serine proteases (SVSP); snake venom metalloprotease (SVMP); Kunitz peptides (KUN); 3-finger toxins (3FT); L-amino acid oxidases (LAAO); cysteine-rich secretory proteins (CRiSP); C-type lectins (CTL); disintegrins (DIS); natriuretic peptides (NP); number of independence claims (k); number of parameters (q); Fisher’s C statistic (C); p value (p); C statistic Information Criterium (CICc); likelihood (l) and CIC weight (w).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Group** | **Toxin** | **Model** | **k** | **q** | **C** | **p** | **CICc** | **delta\_CICc** | **l** | **w** |
| **All** | **CRiSP** | H | 13 | 15 | 37.2 | 0.07181 | 72.2 | 0 | 1 | 0.80718 |
| A | 8 | 20 | 27.2 | 0.03901 | 76.5 | 4.27 | 0.11849 | 0.09564 |
| B | 7 | 21 | 25.4 | 0.03072 | 77.7 | 5.48 | 0.06444 | 0.05202 |
| F | 13 | 15 | 45.7 | 0.00982 | 80.7 | 8.52 | 0.01414 | 0.01141 |
| D | 14 | 14 | 48.4 | 0.00966 | 80.7 | 8.55 | 0.01388 | 0.0112 |
| E | 13 | 15 | 46.1 | 0.00889 | 81.1 | 8.91 | 0.01163 | 0.00939 |
| C | 12 | 16 | 44.1 | 0.00742 | 81.8 | 9.64 | 0.00809 | 0.00653 |
| I | 13 | 15 | 47.8 | 0.00566 | 82.8 | 10.63 | 0.00491 | 0.00396 |
| G | 13 | 15 | 48.6 | 0.00458 | 83.6 | 11.42 | 0.00331 | 0.00267 |
| **All** | **KUN** | D | 14 | 14 | 34.3 | 0.1907 | 66.6 | 0 | 1 | 0.27723 |
| I | 13 | 15 | 32.3 | 0.1844 | 67.3 | 0.623 | 0.73224 | 0.203 |
| E | 13 | 15 | 32.9 | 0.1639 | 67.9 | 1.292 | 0.52415 | 0.14531 |
| F | 13 | 15 | 33.6 | 0.1452 | 68.6 | 1.963 | 0.37477 | 0.1039 |
| C | 12 | 16 | 30.9 | 0.1556 | 68.7 | 2.019 | 0.36442 | 0.10103 |
| G | 13 | 15 | 33.9 | 0.1363 | 68.9 | 2.303 | 0.31624 | 0.08767 |
| H | 13 | 15 | 34.2 | 0.131 | 69.2 | 2.518 | 0.28392 | 0.07871 |
| A | 8 | 20 | 27.2 | 0.039 | 76.5 | 9.814 | 0.0074 | 0.00205 |
| B | 7 | 21 | 25.4 | 0.0307 | 77.7 | 11.032 | 0.00402 | 0.00112 |
| **All** | **LAAO** | G | 13 | 15 | 36.7 | 0.0794 | 71.7 | 0 | 1 | 0.3966 |
| F | 13 | 15 | 38 | 0.0611 | 73 | 1.25 | 0.5346 | 0.212 |
| D | 14 | 14 | 41.7 | 0.0463 | 74 | 2.32 | 0.3135 | 0.1243 |
| E | 13 | 15 | 40.1 | 0.0382 | 75.1 | 3.39 | 0.1839 | 0.0729 |
| C | 12 | 16 | 38.1 | 0.0339 | 75.8 | 4.11 | 0.1279 | 0.0507 |
| I | 13 | 15 | 41 | 0.031 | 76 | 4.29 | 0.1168 | 0.0463 |
| H | 13 | 15 | 41.3 | 0.0291 | 76.3 | 4.58 | 0.1014 | 0.0402 |
| A | 8 | 20 | 27.2 | 0.039 | 76.5 | 4.75 | 0.0929 | 0.0368 |
| B | 7 | 21 | 25.4 | 0.0307 | 77.7 | 5.97 | 0.0505 | 0.02 |
| **All** | **NP** | E | 13 | 15 | 38.6 | 0.05352 | 73.6 | 0 | 1 | 0.45022 |
| C | 12 | 16 | 36.6 | 0.04823 | 74.3 | 0.727 | 0.6952 | 0.31301 |
| A | 8 | 20 | 27.2 | 0.03901 | 76.5 | 2.885 | 0.2363 | 0.10638 |
| B | 7 | 21 | 25.4 | 0.03072 | 77.7 | 4.103 | 0.1285 | 0.05786 |
| D | 14 | 14 | 47.5 | 0.01219 | 79.8 | 6.233 | 0.0443 | 0.01995 |
| I | 13 | 15 | 45 | 0.01168 | 80 | 6.457 | 0.0396 | 0.01784 |
| G | 13 | 15 | 45.4 | 0.01068 | 80.4 | 6.809 | 0.0332 | 0.01496 |
| F | 13 | 15 | 45.7 | 0.00995 | 80.7 | 7.089 | 0.0289 | 0.01301 |
| H | 13 | 15 | 47 | 0.0071 | 82 | 8.392 | 0.0151 | 0.00678 |
| **All** | **SVMP** | G | 13 | 15 | 37.7 | 0.0648 | 72.7 | 0 | 1 | 0.3886 |
| F | 13 | 15 | 38.2 | 0.0574 | 73.2 | 0.568 | 0.7528 | 0.2925 |
| H | 13 | 15 | 40.7 | 0.0333 | 75.7 | 3.017 | 0.2212 | 0.0859 |
| D | 14 | 14 | 43.7 | 0.0297 | 76 | 3.353 | 0.187 | 0.0727 |
| A | 8 | 20 | 27.2 | 0.039 | 76.5 | 3.779 | 0.1512 | 0.0587 |
| B | 7 | 21 | 25.4 | 0.0307 | 77.7 | 4.997 | 0.0822 | 0.0319 |
| E | 13 | 15 | 42.8 | 0.0201 | 77.8 | 5.16 | 0.0758 | 0.0294 |
| C | 12 | 16 | 40.8 | 0.0173 | 78.6 | 5.887 | 0.0527 | 0.0205 |
| I | 13 | 15 | 43.6 | 0.0165 | 78.6 | 5.957 | 0.0509 | 0.0198 |
| **All** | **SVSP** | E | 13 | 15 | 35.1 | 0.1089 | 70.1 | 0 | 1 | 0.4822 |
| C | 12 | 16 | 33.1 | 0.1014 | 70.9 | 0.727 | 0.6952 | 0.3353 |
| D | 14 | 14 | 42.4 | 0.0401 | 74.7 | 4.564 | 0.1021 | 0.0492 |
| G | 13 | 15 | 39.9 | 0.0396 | 74.9 | 4.81 | 0.0903 | 0.0435 |
| F | 13 | 15 | 40.5 | 0.0346 | 75.5 | 5.396 | 0.0674 | 0.0325 |
| A | 8 | 20 | 27.2 | 0.039 | 76.5 | 6.33 | 0.0422 | 0.0204 |
| I | 13 | 15 | 42.4 | 0.0225 | 77.4 | 7.228 | 0.0269 | 0.013 |
| H | 13 | 15 | 42.4 | 0.0224 | 77.4 | 7.256 | 0.0266 | 0.0128 |
| B | 7 | 21 | 25.4 | 0.0307 | 77.7 | 7.548 | 0.023 | 0.0111 |
| **All** | **Venom Complexity** | A | 8 | 20 | 27.2 | 0.03901 | 76.5 | 0 | 1 | 0.3457 |
| F | 13 | 15 | 42.6 | 0.02116 | 77.6 | 1.16 | 0.5589 | 0.1932 |
| B | 7 | 21 | 25.4 | 0.03072 | 77.7 | 1.22 | 0.5439 | 0.188 |
| I | 13 | 15 | 43.1 | 0.01905 | 78.1 | 1.6 | 0.45 | 0.1556 |
| G | 13 | 15 | 46.1 | 0.00901 | 81.1 | 4.59 | 0.1007 | 0.0348 |
| D | 14 | 14 | 48.9 | 0.00853 | 81.2 | 4.78 | 0.0915 | 0.0316 |
| E | 13 | 15 | 47.1 | 0.00694 | 82.1 | 5.6 | 0.0609 | 0.0211 |
| H | 13 | 15 | 47.7 | 0.00586 | 82.7 | 6.24 | 0.0442 | 0.0153 |
| C | 12 | 16 | 45.1 | 0.00574 | 82.8 | 6.32 | 0.0424 | 0.0146 |
| **Elapidae** | **3FT** | D | 14 | 14 | 23.2 | 0.725 | 69.4 | 0 | 1 | 0.466 |
| F | 13 | 15 | 18.2 | 0.87 | 70 | 0.557 | 0.757 | 0.353 |
| I | 13 | 15 | 21.8 | 0.701 | 73.6 | 4.158 | 0.125 | 0.0583 |
| H | 13 | 15 | 22.2 | 0.676 | 74 | 4.623 | 0.0991 | 0.0462 |
| E | 13 | 15 | 22.6 | 0.656 | 74.4 | 4.978 | 0.083 | 0.0387 |
| G | 13 | 15 | 22.8 | 0.645 | 74.6 | 5.171 | 0.0754 | 0.0352 |
| C | 12 | 16 | 22.5 | 0.549 | 80.4 | 10.986 | 0.00412 | 0.00192 |
| A | 8 | 20 | 15.3 | 0.5 | 104.7 | 35.32 | 2.1E-08 | 1E-08 |
| B | 7 | 21 | 15.1 | 0.371 | 114.9 | 45.436 | 1.4E-10 | 6.4E-11 |
| **Elapidae** | **PLA2-I** | F | 13 | 15 | 19.2 | 0.827 | 71 | 0 | 1 | 0.652 |
| D | 14 | 14 | 27 | 0.519 | 73.3 | 2.22 | 0.33 | 0.215 |
| E | 13 | 15 | 24.3 | 0.562 | 76.1 | 5.04 | 0.0806 | 0.0526 |
| H | 13 | 15 | 25.3 | 0.501 | 77.1 | 6.1 | 0.0474 | 0.0309 |
| I | 13 | 15 | 25.8 | 0.475 | 77.6 | 6.56 | 0.0376 | 0.0245 |
| G | 13 | 15 | 26 | 0.463 | 77.8 | 6.78 | 0.0337 | 0.022 |
| C | 12 | 16 | 24.2 | 0.452 | 82.1 | 11.04 | 0.004 | 0.00261 |
| A | 8 | 20 | 15.3 | 0.5 | 104.7 | 33.71 | 4.8E-08 | 3.1E-08 |
| B | 7 | 21 | 15.1 | 0.371 | 114.9 | 43.83 | 3E-10 | 2E-10 |
| **Elapidae** | **Venom Complexity** | I | 13 | 15 | 18.6 | 0.854 | 70.4 | 0 | 1 | 0.651 |
| D | 14 | 14 | 26.3 | 0.557 | 72.5 | 2.16 | 0.34 | 0.221 |
| F | 13 | 15 | 24.3 | 0.561 | 76.1 | 5.7 | 0.058 | 0.0378 |
| E | 13 | 15 | 24.4 | 0.552 | 76.2 | 5.85 | 0.0538 | 0.035 |
| H | 13 | 15 | 24.5 | 0.548 | 76.3 | 5.93 | 0.0517 | 0.0336 |
| G | 13 | 15 | 25.6 | 0.486 | 77.4 | 7.01 | 0.03 | 0.0195 |
| C | 12 | 16 | 24.3 | 0.442 | 82.2 | 11.85 | 0.00267 | 0.00174 |
| A | 8 | 20 | 15.3 | 0.5 | 104.7 | 34.36 | 3.5E-08 | 2.3E-08 |
| B | 7 | 21 | 15.1 | 0.371 | 114.9 | 44.47 | 2.2E-10 | 1.4E-10 |
| **Viperidae** | **CTL** | I | 13 | 15 | 38 | 0.0605 | 76.3 | 0 | 1 | 0.56197 |
| D | 14 | 14 | 43.7 | 0.0298 | 78.8 | 2.54 | 0.28124 | 0.15805 |
| F | 13 | 15 | 41.2 | 0.0294 | 79.5 | 3.24 | 0.19821 | 0.11139 |
| H | 13 | 15 | 41.8 | 0.0256 | 80.1 | 3.82 | 0.14822 | 0.08329 |
| E | 13 | 15 | 43.4 | 0.0177 | 81.6 | 5.35 | 0.06886 | 0.0387 |
| G | 13 | 15 | 43.9 | 0.0156 | 82.1 | 5.86 | 0.0534 | 0.03001 |
| C | 12 | 16 | 42.2 | 0.0122 | 83.7 | 7.47 | 0.02387 | 0.01341 |
| A | 8 | 20 | 31.6 | 0.0112 | 87.5 | 11.2 | 0.0037 | 0.00208 |
| B | 7 | 21 | 29 | 0.0105 | 88.8 | 12.47 | 0.00196 | 0.0011 |
| **Viperidae** | **DIS** | F | 13 | 15 | 39.4 | 0.04419 | 77.7 | 0 | 1 | 0.77338 |
| G | 13 | 15 | 43.3 | 0.01801 | 81.6 | 3.84 | 0.14639 | 0.11322 |
| D | 14 | 14 | 48.7 | 0.00907 | 83.8 | 6.07 | 0.04812 | 0.03721 |
| I | 13 | 15 | 45.9 | 0.00947 | 84.1 | 6.41 | 0.04053 | 0.03135 |
| E | 13 | 15 | 46.7 | 0.00762 | 85 | 7.25 | 0.02667 | 0.02063 |
| H | 13 | 15 | 48.6 | 0.00463 | 86.8 | 9.13 | 0.01041 | 0.00805 |
| C | 12 | 16 | 45.5 | 0.00502 | 87.1 | 9.37 | 0.00925 | 0.00715 |
| A | 8 | 20 | 31.6 | 0.01118 | 87.5 | 9.76 | 0.00762 | 0.00589 |
| B | 7 | 21 | 29 | 0.01051 | 88.8 | 11.03 | 0.00402 | 0.00311 |
| **Viperidae** | **PLA2-II** | E | 13 | 15 | 34.7 | 0.11842 | 73.1 | 0 | 1 | 0.286 |
| D | 14 | 14 | 38.1 | 0.09687 | 73.3 | 0.208 | 0.90138 | 0.258 |
| H | 13 | 15 | 36.2 | 0.08893 | 74.6 | 1.457 | 0.48273 | 0.138 |
| C | 12 | 16 | 33.6 | 0.0917 | 75.3 | 2.216 | 0.33015 | 0.0945 |
| I | 13 | 15 | 37.1 | 0.0734 | 75.5 | 2.394 | 0.30216 | 0.0865 |
| F | 13 | 15 | 37.1 | 0.07298 | 75.5 | 2.421 | 0.29799 | 0.0853 |
| G | 13 | 15 | 38.2 | 0.05847 | 76.6 | 3.47 | 0.1764 | 0.0505 |
| A | 8 | 20 | 30.8 | 0.01429 | 86.9 | 13.834 | 0.00099 | 0.00028 |
| B | 7 | 21 | 29.6 | 0.00855 | 89.8 | 16.643 | 0.00024 | 7E-05 |
| **Viperidae** | **Venom Complexity** | F | 13 | 15 | 42.5 | 0.02199 | 80.7 | 0 | 1 | 0.42196 |
| G | 13 | 15 | 43.5 | 0.01698 | 81.8 | 1.07 | 0.5866 | 0.24751 |
| H | 13 | 15 | 44.9 | 0.01205 | 83.2 | 2.45 | 0.2943 | 0.12419 |
| D | 14 | 14 | 48.6 | 0.00931 | 83.7 | 2.95 | 0.229 | 0.09665 |
| I | 13 | 15 | 46.8 | 0.00745 | 85.1 | 4.32 | 0.1155 | 0.04872 |
| E | 13 | 15 | 47.8 | 0.00565 | 86.1 | 5.37 | 0.0682 | 0.02879 |
| A | 8 | 20 | 31.6 | 0.01118 | 87.5 | 6.74 | 0.0344 | 0.01452 |
| C | 12 | 16 | 46.7 | 0.00366 | 88.2 | 7.49 | 0.0237 | 0.00998 |
| B | 7 | 21 | 29 | 0.01051 | 88.8 | 8.01 | 0.0182 | 0.00767 |

**Figure S1.** Phylogenetic Path Analysis (PPA) models. The arrows represent the direct and indirect effects of the explanatory variables on snake venom. In alternative causal models, Bio1 (Annual Mean Temperature) affects Mass (Body Size), NPP (Net Primary Productivity), and Toxin (Venom Complexity or Toxin). We know that temperature can have a strong effect on vertebrate body sizes (for endothermic and ectothermic species) (Amado et al., 2019; Olalla-Tárraga et al., 2016), given that body size is strongly associated with heat conservation. Additionally, in the causal models, Bio1 was related to NPP. Locations with high temperatures are regions with greater solar radiation incidence, which tends to increase the NPP. Finally, in some causal models, Bio1 has effects on Toxin, given that environments with greater energy can present a higher diversity of prey, favoring a higher venom complexity (*Food availability hypothesis*). In our causal models, the variable Local (island/mainland) affects Mass, NPP, Bio15 (Precipitation Seasonality), and Toxin. Islands can have an important effect on body size, leading to gigantism or miniaturization of different species (Lomolino, 2005). On the other hand, depending on the size of the islands, the levels of NPP and Bio15 can also be affected. Furthermore, since islands tend to have a low resource diversity and are highly isolated, it is expected that the fixation of less complex venom happens in islands (*Biogeography hypothesis*). In our causal models, the thermal instability of the last quaternary (Velocity) affects Mass and Toxin. Thermally unstable environments tend to select larger species through time (Mann et al., 2018), justifying the link between Velocity and Mass. Alternatively, unstable environments can lead to greater species turnover (Morales-Barbero et al*.*, 2021), leading to different potential prey over time. Thus, unstable environments may favor more complex venoms, allowing greater adaptability of snake species to shift prey types (*Food seasonality hypothesis*). Our variable Bio15 has a potential effect on NPP and Toxin. It is known that environments with a more stable rainfall pattern over time tend to be associated with more productive environments. Likewise, environments with higher seasonality are associated with a larger variation of prey throughout the year, which may favor more complex venoms (*Food seasonality hypothesis*). In our causal models, the NPP variable only affects Toxin. This association is related to our *Food availability hypothesis*, which states that more productive environments tend to have a greater diversity of resources favoring a more complexity of the venom (*Food availability hypothesis*). Finally, Mass affects Toxin, since an increase in snake's body size is associated with a more diverse diet, which may be the result of increased venom complexity (*Body size hypothesis*). Our causal models represent different alternatives of direct and indirect causal effects of our predictors on Toxin (Venom Complexity or Toxin), evaluating the *Food availability, Food seasonality, Biogeography,* and *Body size hypotheses*.

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