Table S1: All endocast and brain-size metrics analyzed in the present study. Superscripts indicate the publications from which the optic tectum and hyperpallium volumes were compiled. All optic lobe, Wulst, endocast, and foramen magnum metrics were collected for this study or for Early (2019). Only specimens with complete samples of brain and endocast structure metrics were used in the phylogenetic predictions performed with {BayesModelS} and in the phyANCOVA on relative endocast structure sizes (e.g., *Agelaius phoeniceus*). Specimens that only have brain and brain structure metrics listed in this table were only used in the phyANCOVA on relative brain structure sizes (e.g., *Acanthiza pusilla*). Sources for optic-tectum volumes: 1Iwaniuk et al., 2004; 2Iwaniuk et al., 2006; 3Iwaniuk et al., 2008; 4Iwaniuk et al., 2010; 5Corfield et al., 2011; 6Gutiérrez-Ibáñez et al., 2013; 7Gutiérrez-Ibáñez et al., 2014; 8Corfield et al., 2016 and Corfield, pers. comm.; 9present study. Sources for hyperpallium volumes: iBoire, 1989; iiIwaniuk et al., 2004; iiiIwaniuk and Wylie, 2006; ivIwaniuk et al., 2008; vCorfield et al., 2011; viCorfield et al., 2012; viiGutiérrez-Ibáñez et al., 2013; viiiEarly, 2019, with access to specimens provided by A. Iwaniuk; ixpresent study. Sources for brain volumes align with sources for brain-structure volumes. Abbreviations: FM, foramen magnum; OL, optic lobe; OT, optic tectum; SA, surface area; Vol, volume.

| **Species** | **OT Vol (mm3)** | **Hyperpallium Vol (mm3)** | **Brain Vol (mm3)** | **OL SA (mm2)** | **Wulst SA (mm2)** | **Endocast SA (mm2)** | **FM Area (mm2)** | **FM Width (mm)** | **FM Height (mm)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Acanthiza pusilla*2 | 34.81 | — | 434 | — | — | — | — | — | — |
| *Acanthorhynchus tenuirostris*2 | 29.46 | — | 489 | — | — | — | — | — | — |
| *Accipiter cirrocephalus*7 | 327.2 | — | 4875.48 | — | — | — | — | — | — |
| *Accipiter fasciatus*2 | 236.92 | — | 4875 | — | — | — | — | — | — |
| *Aegolius acadicus*3,iv | 64.49 | 743.75 | 2857 | — | — | — | — | — | — |
| *Aegotheles insignis*3,iv | 73.64 | 363.63 | 1540 | — | — | — | — | — | — |
| *Agapornis personatus*3,iv | 82.57 | 204.54 | 2786 | — | — | — | — | — | — |
| *Agapornis roseicollis*3,iv | 79.74 | 194.32 | 2008 | — | — | — | — | — | — |
| *Agelaius phoeniceus*7,viii | 50.83 | 106.06 | 1614.86 | 104.38 | 115.50 | 831.98 | 11.087 | 4.08 | 3.46 |
| *Alectoris chukar*3,iv | 213.36 | 164.61 | 2500 | — | — | — | — | — | — |
| *Alisterus scapularis*3,iv | 201.21 | 506.55 | 4779 | — | — | — | — | — | — |
| *Amazilia tzacatl*7,viii | 12.77 | 11.32 | 182.19 | 35.43 | 27.70 | 215.36 | 3.15 | 2.17 | 1.85 |
| *Amazona aestiva*3,iv | 272.5 | 759.2 | 7903 | — | — | — | — | — | — |
| *Anas castanea*4 | 98.74 | — | 3424 | — | — | — | — | — | — |
| *Anas clypeata*4 | 97.93 | — | 3289 | — | — | — | — | — | — |
| *Anas crecca*4 | 123.92 | — | 3166 | — | — | — | — | — | — |
| *Anas discors*4 | 95.47 | — | 2896 | — | — | — | — | — | — |
| *Anas platyrhynchos*3,iv | 251.48 | 572.23 | 5738 | 164.07 | 211.11 | 2098.36 | 50.25 | 7.32 | 8.74 |
| *Anser anser*4 | 393.7 | — | 12124 | — | — | — | — | — | — |
| *Apteryx australis*8,vi | 32.0 | 294 | 8293.08, 5299vi | 56.86 | 174.36 | 5861.30 | 44.99 | 8.55 | 6.7 |
| *Apus apus*2 | 42.84 | — | 668 | 56.86 | — | 439.81 | 10.04 | 3.55 | 3.6 |
| *Aratinga acuticaudata*3,iv | 114.88 | 240.73 | 5222 | — | — | — | — | — | — |
| *Archaeopteryx lithographica*9 | 111.9 | — | 1160.86 | 115.21 | — | 779.81 | 7.14 | 4.19 | 4.65 |
| *Ardea cinerea*3,iv | 697.78 | 520.41 | 8446 | 296.69 | 233.33 | 2390.35 | 30.75 | 6.75 | 5.8 |
| *Asio flammeus*6,vii | 99.16 | 795.42 | 6221.04 | — | — | — | — | — | — |
| *Athene cunicularia*3,iv | 148.71 | 1707.67 | 5878 | — | — | — | — | — | — |
| *Aythya affinis*4 | 131.66 | — | 4142 | — | — | — | — | — | — |
| *Aythya americana*4 | 131.7 | — | 5245 | — | — | — | — | — | — |
| *Baeolophus bicolor*7 | 47.15 | — | 837.26 | — | — | — | — | — | — |
| *Bombycilla cedrorum*7 | 31.98 | — | 805.3 | — | — | — | — | — | — |
| *Bonasa umbellus*2,viii | 182.33 | 171.88 | 3136 | 192.72 | 97.80 | 1204.65 | 19.72 | 5.76 | 4.36 |
| *Bubo virginianus*6,vii | 277.02 | 2617.42 | 17199.1 | 238.54 | 1145.29 | 4807.23 | 44.16 | 8.48 | 6.63 |
| *Bubo scandiaca*6,vii | 286.04 | 3561.19 | 17346.0 | — | — | — | — | — | — |
| *Bubulcus ibis*3,iv | 211.02 | 220.7 | 4025 | 199.45 | 147.66 | 1271.3 | 17.91 | 5.09 | 4.48 |
| *Bucephala albeola*4 | 127.91 | — | 4123 | — | — | — | — | — | — |
| *Bucephala clangula*4 | 210.87 | — | 5961 | — | — | — | — | — | — |
| *Buteo swainsoni*4 | 450.07 | — | 8099 | 266.79 | 165.67 | 2334.34 | 38.15 | 7.65 | 6.35 |
| *Cacatua galerita*4 | 322.11 | — | 14515 | — | — | — | — | — | — |
| *Cacatua roseicapilla*3,iv | 203.44 | 676.33 | 6653 | — | — | — | — | — | — |
| *Cacatua tenuirostris*7 | 224.85 | — | 11778.0 | — | — | — | — | — | — |
| *Calidris minutilla*3,iv | 43.34 | 12.66 | 472 | — | — | — | — | — | — |
| *Calypte anna*2 | 12.33 | — | 183 | — | — | — | — | — | — |
| *Calyptorhynchus funereus*3,iv | 307.5 | 2036.7 | 16078 | — | — | — | — | — | — |
| *Caprimulgus vociferus*3,iv | 58.81 | 51.62 | 734 | — | — | — | — | — | — |
| *Carduelis tristis*7 | 21.52 | — | 555.89 | — | — | — | — | — | — |
| *Chaetura pelagica*2 | 30.47 | — | 343 | — | — | — | — | — | — |
| *Charadrius vociferus*3,iv | 130.65 | 19.74 | 1073 | — | — | — | — | — | — |
| *Chenonetta jubata*4 | 150.79 | — | 4329 | — | — | — | — | — | — |
| *Chlorostilbon mellisugus*2 | 10.44 | — | 119 | — | — | — | — | — | — |
| *Chrysolophus pictus*3,iv | 316.06 | 175.12 | 3369 | — | — | — | — | — | — |
| *Colinus virginianus*3,iv | 112.3 | 69.18 | 1091 | 104.63 | 50.78 | 652.79 | 12.0 | 4.7 | 3.25 |
| *Collocalia esculenta*2 | 9.51 | — | 121 | — | — | — | — | — | — |
| *Collocalia troglodytes*2 | 9.71 | — | 139 | — | — | — | — | — | — |
| *Columba leucomela*4 | 201.9 | — | 2206 | — | — | — | — | — | — |
| *Columba livia*3,iv | 198.29 | 187.43 | 2093 | 128.07 | 57.02 | 882.24 | 19.73 | 5.38 | 4.67 |
| *Cormobates leucophaea*7 | 64.87 | — | 781.85 | — | — | — | — | — | — |
| *Corvus corone*4 | 349.86 | — | 9382 | — | — | — | — | — | — |
| *Coturnix coturnix*3,iv | 87.47 | 71.25 | 811 | — | — | — | — | — | — |
| *Crypturellus tataupa*4 | 159.25 | — | 1583 | 111.71 | 34.99 | 669.15 | 7.51 | 3.75 | 2.55 |
| *Dacelo novaeguineae*3,iv | 333.9 | 176.3 | 3515 | 271.61 | 85.15 | 1607.26 | 19.15 | 5.3 | 4.6 |
| *Dendrocygna eytoni*3,iv | 163.65 | 499.07 | 4850 | — | — | — | — | — | — |
| *Dinornis robustus*9,ix | 93.6 | 4044.3 | 49034.7 | 194.29 | 1533.57 | 8481.3 | 183.06 | 14.1 | 16.53 |
| *Dromaius novaehollandiae*8,vi | 494.2 | 926 | 21029.38, 21830vi | 446.03 | 913.26 | 5861.30 | 59.42 | 10.02 | 7.55 |
| *Ducula spilorrhoa*7 | 89.79 | — | 2697.88 | — | — | — | — | — | — |
| *Dumetella carolinensis*7 | 50.18 | — | 1324.32 | — | — | — | — | — | — |
| *Eclectus roratus*3,iv | 221.1 | 701.68 | 6700 | — | — | — | — | — | — |
| *Egretta thula*3,iv | 443.74 | 196.41 | 3740 | — | — | — | — | — | — |
| *Emblema pictum*7 | 18.96 | — | 366.8 | — | — | — | — | — | — |
| *Entomyzon cyanotis*3,iv | 97.04 | 129.88 | 2227 | — | — | — | — | — | — |
| *Eopsaltria australis*2 | 39.4 | — | 839 | — | — | — | — | — | — |
| *Erythrura gouldiae*7 | 20.94 | — | 427.61 | — | — | — | — | — | — |
| *Euphagus carolinus*7 | 82.1 | — | 1656.56 | — | — | — | — | — | — |
| *Eurostopodus argus*2,iii | 60.97 | 59.3 | 1013; 982 | — | — | — | — | — | — |
| *Falcipennis canadensis*7 | 179.87 | — | 2720 | — | — | — | — | — | — |
| *Falco berigora*2 | 387.05 | — | 6007 | — | — | — | — | — | — |
| *Falco cenchroides*3,iv | 213.73 | 252.55 | 3211 | — | — | — | — | — | — |
| *Falco columbarius*7 | 130.46 | — | 3509.65 | — | — | — | — | — | — |
| *Falco longipennis*2 | 200.36 | — | 3035 | — | — | — | — | — | — |
| *Falco peregrinus*3,iv | 338.21 | 529 | 6187 | — | — | — | — | — | — |
| *Fulica americana*2,viii | 127.65 | 227.54 | 2719 | 130.27 | 94.51 | 1118.26 | 26.70 | 6.06 | 5.61 |
| *Fulica armillata*4 | 260.11 | — | 4015 | — | — | — | — | — | — |
| *Gallinula tenebrosa*7 | 94.62 | — | 2726.54 | — | — | — | — | — | — |
| *Gallus gallus*3,iv | 279.55 | 132.34 | 2993 | — | — | — | — | — | — |
| *Garrulus glandarius*3,iv | 248.9 | 448.99 | 3943 | — | — | — | — | — | — |
| *Geopelia humeralis*7 | 108.92 | — | 1106.18 | — | — | — | — | — | — |
| *Geopelia placida*4 | 64 | — | 776.1 | — | — | — | — | — | — |
| *Glaucis hirsutus*2 | 12.96 | — | 123 | — | — | — | — | — | — |
| *Glossopsitta concinna*3,iv | 111.79 | 358.43 | 3150 | — | — | — | — | — | — |
| *Glossopsitta porphyrocephala*7 | 60.62 | — | 1939.19 | — | — | — | — | — | — |
| *Gymnorhina tibicen*2 | 202.27 | — | 4017 | — | — | — | — | — | — |
| *Haemorhous mexicanus*7 | 39.49 | — | 1058.98 | — | — | — | — | — | — |
| *Junco hyemalis*7,viii | 50.54 | 61.04 | 879.05 | 70.09 | 53.82 | 433.84 | 5.92 | 2.98 | 2.53 |
| *Indicator minor*7 | 34.51 | — | 649.61 | — | — | — | — | — | — |
| *Larus novaehollandiae*7 | 176.08 | — | 2968.15 | — | — | — | — | — | — |
| *Larus philadelphia*7 | 160.31 | — | 2512.55 | 140.89 | 60.99 | 1034.24 | 13.29 | 4.7 | 3.6 |
| *Leucosarcia melanoleuca*7 | 118.75 | — | 2217 | — | — | — | — | — | — |
| *Lichenostomus penicillatus*2 | 47.94 | — | 917 | — | — | — | — | — | — |
| *Limnodromus griseus*3,iv | 51.12 | 33.92 | 1124 | — | — | — | — | — | — |
| *Limosa lapponica*vi | — | 124 | 2417 | — | — | — | — | — | — |
| *Lithornis plebius*9 | 198.3 | — | 2501.93 | 172.58 | — | 1248.72 | 44.10 | 5.66 | 6.77 |
| *Llallawavis scagliai*9,ix | 1216.5 | 5110.5 | 42470 | 664.25 | 1640.55 | 8477.1 | 162.02 | 14.12 | 14.61 |
| *Manorina melanocephala*2 | 88.5 | — | 2279 | — | — | — | — | — | — |
| *Meleagris gallopavo*3,iv | 771.14 | 469.04 | 7990 | 372.96 | 238.07 | 2671.22 | 53.86 | 7.68 | 8.93 |
| *Melopsittacus undulatus*3,iv | 59.64 | 84.35 | 1220 | 67.10 | 88.13 | 677.39 | 8.37 | 3.86 | 2.76 |
| *Melospiza melodia*7 | 47.79 | — | 908.78 | — | — | — | — | — | — |
| *Menura novaehollandiae*2 | 384.66 | — | 10163 | — | — | — | — | — | — |
| *Mergus serrator*4 | 188.89 | — | 4754 | 154.47 | 147.49 | 1622.22 | 38.93 | 6.53 | 7.59 |
| Miocene galliform9,ix | 209.2 | 227.1 | 3201.68 | 172.90 | 127.88 | 1399.55 | 25.75 | 5.52 | 5.94 |
| *Myiopsitta monachus*3,iv | 156.38 | 253.61 | 3697 | — | — | — | — | — | — |
| *Neopsephotus bourkii*5,v | 56.42 | 118.23 | 1213 | — | — | — | — | — | — |
| *Nestor notabilis*5,v | 319.99 | 1505.48 | 13388.0 | — | — | — | — | — | — |
| *Ninox boobook*3,iv | 148.15 | 1503.68 | 5626 | — | — | — | — | — | — |
| *Nothura darwinii*vi | — | 86 | 1482 | — | — | — | — | — | — |
| *Numida meleagris*3,iv | 328.46 | 228.52 | 3951 | — | — | — | — | — | — |
| *Nyctibius griseus*3,iv | 125.58 | 176.67 | 1980 | — | — | — | — | — | — |
| *Nycticorax caledonicus*3,iv | 268.95 | 224.17 | 3360 | — | — | — | — | — | — |
| *Nyctidromus albicollis*3,iv | 36.95 | 66.03 | 910 | 70.24 | 46.30 | 525.26 | 8.06 | 3.6 | 2.85 |
| *Nymphicus hollandicus*3,iv | 81.29 | 247.88 | 2339 | — | — | — | — | — | — |
| *Ortalis canicollis*3,iv | 271.27 | 203.83 | 3374 | — | — | — | — | — | — |
| *Paraptenodytes antarcticus*9,ix | 861.4 | 3116.7 | 28445.8 | 454.02 | 876.25 | 5861.7 | 110.79 | 11.6 | 12.16 |
| *Pardalotus punctatus*2 | 17.09 | — | 401 | — | — | — | — | — | — |
| *Parus atricapillus*7 | 50.44 | — | 814.48 | — | — | — | — | — | — |
| *Parus carolinensis*7 | 25.35 | — | 680.02 | — | — | — | — | — | — |
| *Parus gambeli*4 | 35.62 | — | 624.8 | — | — | — | — | — | — |
| *Passer domesticus*3,iv | 62.69 | 117.09 | 989 | 63.33 | 65.41 | 557.60 | 7.50 | 3.59 | 2.66 |
| *Passerina cyanea*7 | 35.76 | — | 618.53 | — | — | — | — | — | — |
| *Pavo cristatus*2,vi | 284.95 | 281 | 4560 | — | — | — | — | — | — |
| *Pelecanus conspicillatus*7 | 258.77 | — | 22500 | — | — | — | — | — | — |
| *Perdix perdix*4 | 150.03 | — | 1849 | — | — | — | — | — | — |
| *Petroica multicolor*7 | 57.4 | — | 473.94 | — | — | — | — | — | — |
| *Phaethornis superciliosus*7 | 14.72 | — | 216.15 | — | — | — | — | — | — |
| *Phalacrocorax auritus*2,i | 187.24 | 1381.2 | 7323 | 259.0 | 534.31 | 3163.18 | 39.28 | 8.9 | 5.62 |
| *Phaps elegans*1,ii | 154.61 | 121.64 | 1648.28 | — | — | — | — | — | — |
| *Phasianus colchicus*3,iv | 304.91 | 322.69 | 1865 | — | — | — | — | — | — |
| *Picoides pubescens*7 | 50.09 | — | 997.53 | 78.11 | 87.73 | 708.61 | 5.88 | 3.65 | 2.05 |
| *Pionus menstruus*3,iv | 257.95 | 408.63 | 5473 | — | — | — | — | — | — |
| *Platycercus elegans*3,iv | 158.3 | 348.05 | 3822 | — | — | — | — | — | — |
| *Platycercus eximius*5,v | 129.84 | 317.72 | 3258.48 | — | — | — | — | — | — |
| *Podargus strigoides*3,iv | 290.88 | 1226.89 | 5311 | — | — | — | — | — | — |
| *Polytelis swainsonii*3,iv | 170 | 288.77 | 3149 | — | — | — | — | — | — |
| *Porphyrio porphyrio*v | — | 236 | 4186 | — | — | — | — | — | — |
| *Psephotus haematonotus*3,iv | 73.47 | 174.56 | 1914 | — | — | — | — | — | — |
| *Psilopterus lemoinei*9,ix | 716.7 | 2316.1 | 20784.9 | 454.49 | 856.3 | 5144 | 89.74 | 9.2 | 12.42 |
| *Psittacula eupatria*1,ii | 161.35 | 557.26 | 6205.62 | — | — | — | — | — | — |
| *Psittacula krameri*3,iv | 120.45 | 565.67 | 4239 | — | — | — | — | — | — |
| *Psittacus erithacus*5,v | 155.14 | 668.55 | 6405.41 | 251.59 | 424.81 | 3071.0 | 26.06 | 7.12 | 4.66 |
| *Ptilinopus superbus*4 | 66.15 | — | 1052.1 | 93.83 | 51.63 | 671.1 | 9.04 | 3.9 | 2.95 |
| *Puffinus tenuirostris*3,iv | 4422.99 | 442.32 | 4658 | — | — | — | — | — | — |
| *Pyrrhura molinae*3,iv | 232.93 | 497.19 | 4656 | — | — | — | — | — | — |
| *Rhea americana*3,iv | 1286.6 | 2295.13 | 19228 | 514.68 | 514.68 | 4758.69 | 78.09 | 9.7 | 10.25 |
| *Rhynchotus rufescens*2 | 327.43 | — | 3377 | — | — | — | — | — | — |
| *Rollandia rolland*4 | 209.99 | — | 2059 | — | — | — | — | — | — |
| *Scolopax rusticola*7,viii | 104.92 | 130.37 | 2593.63 | 97.18 | 75.57 | 1232.53 | 31.19 | 5.84 | 6.8 |
| *Selasphorus rufus*4 | 11.75 | — | 121 | — | — | — | — | — | — |
| *Sephanoides sephaniodes*2 | 10.19 | — | 134 | — | — | — | — | — | — |
| *Sitta carolinensis*7 | 47.01 | — | 1000 | — | — | — | — | — | — |
| *Spheniscus magellanicus*3,iv | 672.29 | 2362.55 | 16757 | 290.41 | 546.88 | 3877.36 | 77.91 | 10.83 | 9.16 |
| *Sphyrapicus varius*7 | 65.1 | — | 888.4 | 71.58 | 96.71 | 676.18 | 7.70 | 4 | 2.45 |
| *Spizella passerina*7 | 32.59 | — | 595.99 | — | — | — | — | — | — |
| *Spizella pusilla*7 | 31.2 | — | 544.11 | — | — | — | — | — | — |
| *Stagonopleura guttata*7 | 34.59 | — | 720.08 | — | — | — | — | — | — |
| *Steatornis caripensis*3,iv | 104.7 | 749.53 | 3900 | 97.59 | 214.83 | 1355.84 | 23.66 | 5.15 | 5.85 |
| *Sterna hirundo*3,iv | 121.49 | 57.09 | 1593 | — | — | — | — | — | — |
| *Stigmatopelia chinensis*7 | 123.37 | — | 1430.5 | — | — | — | — | — | — |
| *Strepera versicolor*1,ii | 271.02 | 278.53 | 5366.65 | — | — | — | — | — | — |
| *Streptopelia risoria*7,iii | 95.11 | — | 1141 | — | — | — | — | — | — |
| *Strigops habroptila*5,v | 122.75 | 1754.89 | 14768 | — | — | — | — | — | — |
| *Strix nebulosa*6,vii | 161.30 | 1880.85 | 13433.4 | — | — | — | — | — | — |
| *Strix varia*6,vii | 166.64 | 2036.38 | 12727.1 | — | — | — | — | — | — |
| *Surnia ulula*6,vii | 204.76 | 1544.34 | 9408.3 | — | — | — | — | — | — |
| *Tadorna variegata*vi | — | 215 | 4157 | — | — | — | — | — | — |
| *Taeniopygia bichenovii*2 | 25.81 | — | 409 | — | — | — | — | — | — |
| *Taeniopygia guttata*2 | 20.9 | — | 328 | — | — | — | — | — | — |
| *Thalassarche melanophrys*7 | 246.4 | — | 14129.3 | 261.1 | 675.76 | 4330.88 | 75.1 | 10.45 | 9.15 |
| *Tinamus major*vi | — | 134 | 2242 | — | — | — | — | — | — |
| *Todiramphus sanctus*1,ii | 83.09 | 71.2 | 935.65 | — | — | — | — | — | — |
| *Trichoglossus haematodus*3,iv | 125.6 | 409.77 | 3726 | — | — | — | — | — | — |
| *Troglodytes aedon*7 | 42.98 | — | 839.09 | — | — | — | — | — | — |
| *Turdus merula*7 | 124.05 | — | 1914.09 | — | — | — | — | — | — |
| *Tyto alba*3,iv | 136.51 | 1605.41 | 6149 | 92.82 | 616.3 | 2249.32 | 23.52 | 5.99 | 5.0 |
| *Vanellus chilensis*4 | 331.3 | — | 2461 | — | — | — | — | — | — |
| *Vanellus miles*3,iv | 205.47 | 127.85 | 2686 | — | — | — | — | — | — |
| *Vanellus spinosus*vi | — | 103 | 2067 | — | — | — | — | — | — |
| *Zonotrichia albicollis*7 | 56.88 | — | 1220.37 | — | — | — | — | — | — |