**Electronic Supplementary information for:**

**Olfactory Receptor Repertoire Size in Dinosaurs**

Graham M. Hughes\*1, John A. Finarelli1,2.

\*Corresponding author: g.hughes@ucd.ie

*1School of Biology and Environmental Science, University College Dublin, Belfield, Dublin 4, Ireland*

*2Earth Institute, University College Dublin, Belfield, Dublin 4, Ireland*

**Supplementary Table S1.** The list of extinct and extant taxa included in this study. OR repertoire sizes OB ratio, Diet and Body mass are displayed. Where

multiple OB ratios are available, the mean ratio was used (denoted by \*). PGLS corrected repertoire sizes are inferred for extinct taxa. †

indicates extinct taxon.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Common name** | **OR Repertoire** | **OB ratio (%)** | **Inferred OR Repertoire** | **Diet** | **Body mass (kg)** |
| *Alligator mississippiensis* | Alligator | 1077 | 49.8 | - | Carnivore | 150 |
| 54.3 | - |
| 55.1 | - |
| 53\* | - |
| *Tinamus guttatus* | White-throated tinamou | 388 | 19.5 | - | Omnivore | 0.8 |
| *Struthio camelus* | Ostrich | 318 | 19.2 | - | Omnivore | 111 |
| *Taeniopygia guttata* | Zebra finch | 688 | 9.7 | - | Herbivore | 0.0122 |
| *Geospiza fortis* | Medium ground finch | 182 | 9.7 | - | Herbivore | 0.0183 |
| *Corvus brachyrhynchos* | American crow | 229 | 5 | - | Omnivore | 0.506 |
| *Manacus vitellinus* | Golden-collared manakin | 227 | 9.7 | - | Frugivore | 0.0193 |
| *Acanthisitta chloris* | Rifleman | 222 | 9.7 | - | Insectivore | 0.007 |
| *Melopsittacus undulatus* | Budgerigar | 484 | 6.2 | - | Herbivore | 0.029 |
| *Nestor notabilis* | Kea | 239 | 8 | - | Omnivore | 0.956 |
| *Falco peregrinus* | Peregrine falcon | 460 | 20 | - | Carnivore | 0.815 |
| *Cariama cristata* | Red-legged seriema | 293 | 22.2 | - | Carnivore | 1.4 |
| *Picoides pubescens* | Downy woodpecker | 252 | 10 | - | Omnivore | 0.028 |
| *Merops nubicus* | Northern carmine bee-eater | 252 | 14.5 | - | Insectivore | 0.051 |
| *Colius striatus* | Speckled mousebird | 292 | 9.7 | - | Frugivore | 0.055 |
| *Tyto alba* | Barn owl | 321 | 18.5 | - | Carnivore | 0.392 |
| *Haliaeetus leucocephalus* | Bald eagle | 262 | 18 | - | Piscivore | 5.35 |
| *Haliaeetus albicilla* | White-tailed eagle | 283 | 18 | - | Carnivore | 5.572 |
| *Cathartes aura* | Turkey vulture | 400 | 28.7 | - | Carnivore | 2.006 |
| *Pelecanus crispus* | Dalmatian pelican | 330 | 9.7 | - | Piscivore | 10 |
| *Egretta garzetta* | Little egret | 491 | 21.7 | - | Omnivore | 0.55 |
| *Nipponia nippon* | Crested ibis | 371 | 21.7 | - | Carnivore | 1.9 |
| *Phalacrocorax carbo* | Great cormorant | 270 | 14.5 | - | Piscivore | 2.4 |
| *Pygoscelis adeliae* | Adélie penguin | 320 | 17 | - | Carnivore | 4.85 |
| *Aptenodytes forsteri* | Emperor penguin | 355 | 17 | - | Carnivore | 38.2 |
| *Fulmarus glacialis* | Northern fulmar | 370 | 27.1 | - | Carnivore | 0.613 |
| *Gavia stellata* | Red-throated loon | 369 | 20 | - | Piscivore | 1.729 |
| *Phaethon lepturus* | White-tailed tropicbird | 306 | 20 | - | Carnivore | 0.33 |
| *Balearica regulorum* | Grey crowned crane | 369 | 22.2 | - | Omnivore | 3.777 |
| *Charadrius vociferus* | Killdeer | 393 | 16.1 | - | Omnivore | 0.101 |
| *Ophisthocomus hoazin* | Hoatzin | 467 | 24.2 | - | Herbivore | 0.696 |
| *Calypte anna* | Anna’s hummingbird | 324 | 14 | - | Nectivore | 0.0045 |
| *Chaetura pelagica* | Chimney swift | 355 | 18.8 | - | Carnivore | 0.024 |
| *Antrostomus carolinensis* | Chuck-will’s-widow | 353 | 23.8 | - | Insectivore | 0.188 |
| *Cuculus canorus* | Common cuckoo | 266 | 19.5 | - | Insectivore | 0.117 |
| *Mesitornis unicolor* | Brown mesite | 343 | 22.2 | - | Omnivore | 0.148 |
| *Pterocles gutturalis* | Yellow-throated sandgrouse | 280 | 20.7 | - | Herbivore | 0.342 |
| *Columba livia* | Rock dove | 437 | 21.2 | - | Herbivore | 0.355 |
| *Phoenicopterus ruber* | American flamingo | 363 | 21.7 | - | Carnivore | 3.579 |
| *Podiceps cristatus* | Great crested glebe | 319 | 24.5 | - | Carnivore | 0.92 |
| *Meleagris gallopavo* | Wild turkey | 313 | 13.5 | - | Omnivore | 6.05 |
| *Gallus gallus* | Chicken | 674 | 15.4 | - | Omnivore | 0.904 |
| *Anas platyrhynchos* | Mallard duck | 344 | 19 | - | Omnivore | 1.082 |
| †*Allosaurus fragilis* |  | - | 51.6 | 540 | Carnivore | 2545.13 |
| 50 | 531 |
| 50.8\* | 536 |
| †*Acrocanthosaurus atokensis* |  | - | 58.1 | 575 | Carnivore | 3777.58 |
| †*Carcharodontosaurus saharicus* |  | - | 56 | 564 | Carnivore | 7905.47 |
| †*Giganotosaurus carolinii* |  | - | 57.7 | 573 | Carnivore | 7559.49 |
| †*Ceratosaurus magnicornis* |  | - | 48.1 | 521 | Carnivore | 538.86 |
| †*Majungasaurus crenatissimus* |  | - | 48.3 | 522 | Carnivore | 1130 |
| †*Dilong paradoxus* |  | - | 27 | 407 | Carnivore | 9.69 |
| †*Albertosaurus sarcophagus* |  | - | 71 | 645 | Carnivore | 2545.13 |
| †*Gorgosaurus libratus* |  | - | 68.5 | 631 | Carnivore | 2709.45 |
| †*Tarbosaurus bataar* |  | - | 65.1 | 613 | Carnivore | 2164.6 |
| †*Tyrannosaurus rex* |  | - | 66.5 | 621 | Carnivore | 5855.3 |
| 71 | 645 |
| 68.3 | 630 |
| 68.7\* | 632 |
| †*Garudimimus brevipes* |  | - | 28.8 | 417 | Omnivore | 97.84 |
| †*Ornithomimus edmontonensis* |  | - | 31.4 | 431 | Omnivore | 152.74 |
| †*Dromiceiomimus brevitertius* |  | - | 29.4 | 420 | Omnivore | 206.79 |
| †*Struthiomimus altus* |  | - | 32.5 | 437 | Omnivore | 277.97 |
| †*Citipati osmolskae* |  | - | 31.5 | 431 | Omnivore | 129.78 |
| †*Saurornitholestes langstoni* |  | - | 34.8 | 449 | Carnivore | 16.62 |
| †*Bambiraptor feinbergi* |  | - | 28.5 | 415 | Carnivore | 2.44 |
| †*Velociraptor mongoliensis* |  | - | 35.7 | 454 | Carnivore | 13.36 |
| †*Troodon formosus* |  | - | 33.2 | 440 | Carnivore | 60.76 |
| 33.5 | 442 |
| 32.6 | 437 |
| 33 | 439 |
| 33.1\* | 440 |
| †*Archaeopteryx lithographica* |  | - | 17.1 | 353 | Carnivore | 0.28 |
| †*Confuciusornis sanctus* |  | - | 17.9 | 358 | Piscivore | 0.277 |
| †*Hesperornis regalis* |  | - | 15.3 | 344 | Piscivore | 10.608 |
| 21.3 | 376 |
| 18.3\* | 360 |
| †*Ichthyornis dispar* |  | - | 18.1 | 359 | Piscivore | 0.35 |
| †*Lithornis plebius* |  | - | 36.5 | 458 | - | 0.48 |
| †*Lithornis promiscuus* |  | - | 37.7 | 465 | - | 0.908 |
| †*Deinonychus antirrhopus* |  | - | 41 | 483 | Carnivore | 56.7 |
| †*Tsaagan mangas* |  | - | 36 | 456 | Carnivore | 13.36 |
| †*Viavenator exxoni* |  | - | 57 | 569 | Carnivore | - |
| †*Erlikosaurus andrewsi* |  | - | 40 | 477 | Herbivore | 173.7 |
| †*Euoplocephalus sp* |  | - | 52 | 542 | Herbivore | 2675.90 |
| †*Pawpawsaurus campbelli* |  | - | 46.2 | 511 | Herbivore | - |
| †*Panoplosaurus mirus* |  | - | 44 | 499 | Herbivore | 1600 |

**Supplementary Table S2.** Correlations between OB ratio and OR repertoire size in birds were investigated using phylogenetically uncorrected and corrected Pearson’s correlation coefficient (r). Correlations for individual OR gene families, OR gene class and total OR repertoire size are given. The p-values were adjusted for multiple comparisons using the Benjamini-Hochberg false discovery rate (FDR, [40]). Significant p-values are highlighted in bold. Correlations with and without outlier species (*Gallus* *gallus*, *Melopsittacus* *undulates* and *Taeniopygia* *guttata*) are displayed.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Family** | **Aves (n = 39)** | | | | **Aves (n = 42)** | | | |
| **Phylogenetically uncorrected r** | **Adjusted p-value** | **Phylogenetically corrected r** | **Adjusted p-value** | **Phylogenetically uncorrected r** | **Adjusted p-value** | **Phylogenetically corrected r** | **Adjusted p-value** |
| OR 1/3/7 | 0.2261 | 0.1791 | -0.1555 | 0.4019 | 0.1816 | 0.2496 | -0.0788 | 0.6677 |
| OR 2/13 | 0.4750 | **0.0045** | 0.4446 | **0.0206** | 0.3751 | **0.0267** | -0.0878 | 0.6677 |
| OR 4 | 0.3952 | **0.0179** | 0.4061 | **0.0206** | 0.3212 | **0.04845** | 0.32448 | 0.0841 |
| OR 5/8/9 | 0.5556 | **0.0008** | 0.1830 | 0.3369 | 0.4410 | **0.0154** | 0.195§ | 0.3775 |
| OR 6 | 0.6278 | **9.193e-05** | 0.4172 | **0.0206** | 0.6321 | **9.96e-05** | 0.5317 | **0.0041** |
| OR 10 | 0.4762 | **0.0045** | 0.4113 | **0.0206** | 0.3815 | **0.0251** | 0.3631 | 0.0632 |
| OR 11 | 0.5485 | **0.0009** | 0.5096 | **0.0129** | 0.4847 | **0.0080** | 0.4873 | **0.0074** |
| OR 12 | 0.2094 | 0.2008 | 0.0180 | 0.9133 | 0.2625 | 0.1085 | 0.3875 | 0.0524 |
| OR 14 | 0.3995 | **0.0179** | 0.2349 | 0.2624 | 0.2280 | 0.1578 | -0.03695 | 0.8163 |
| OR 51 | 0.4140 | **0.0154** | 0.1351 | 0.4438 | 0.3788 | **0.0251** | 0.1341 | 0.5156 |
| OR 52 | 0.3267 | 0.0494 | 0.2069 | 0.3206 | 0.3561 | **0.0289** | 0.3392 | 0.0783 |
| Alpha (Class I) | 0.3868 | **0.0191** | 0.1943 | 0.3301 | 0.3668 | **0.0262** | 0.1595 | 0.4870 |
| Gamma (Class II) | 0.6267 | **9.193e-05** | 0.4133 | **0.0206** | 0.4208 | **0.0154** | 0.2474 | 0.2284 |
| Total OR | 0.6516 | **9.193e-05** | 0.4289 | **0.0206** | 0.4208 | **0.0154** | 0.1319 | 0.5156 |

**Supplementary Table S3.** Internal ancestral node estimates of OB ratios and OR gene repertoires using three different methods are displayed. All extant taxa, including alligator, is included. Information pertaining to what each ancestral node represents is also given. Node numbers correspond to Supplementary Figure 4.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Node description** | **Node** | **Olfactory bulb ratio** | | | **Olfactory receptor gene repertoire** | | |
|  |  | **ML** | **PIC** | **GLS** | **ML** | **PIC** | **GLS** |
| Alligator+Aves | 1 | 32.09 | 25.49 | 25.49 | 488 | 497 | 497 |
| Palaeognathae+ Neognathae | 2 | 32.15 | 19.22 | 24.84 | 470 | 365 | 483 |
| Galloanserae+ Strisores+Columbaves+Neoaves (Neognathae) | 3 | 30.52 | 19.19 | 23.8 | 349 | 353 | 355 |
| Columbaves+Neoaves | 5 | 28.03 | 20.2 | 22.13 | 436 | 368 | 462 |
| Aequorlitornithes+Afroaves+Opisthocomus+Balearica (Neoaves) | 6 | 24.59 | 20.04 | 21.4 | 418 | 429 | 430 |
| Aequorlitornithes+ Afroaves + Opisthocomus | 7 | 23.65 | 19.29 | 21.19 | 471 | 494 | 472 |
| Aequornithes+Phaethon+Mirandornithes+Charadrius (Aequorlitornithes) | 8 | 19.59 | 19.69 | 19.94 | 393 | 349 | 433 |
| Aequornithes+Phaethon | 9 | 17.74 | 19.46 | 19.67 | 349 | 345 | 347 |
| Pelecaniformes+Phalacrocorax+Austrodyptornithes+Gavia (Aequornithes) | 10 | 18.24 | 19.25 | 19.54 | 342 | 340 | 342 |
| Pelecaniformes+Phalacrocorax+Austrodyptornithes | 11 | 18.75 | 18.9 | 19.34 | 364 | 350 | 411 |
| Pelecaniformes+Phalacrocorax | 12 | 17.43 | 16.83 | 17.52 | 325 | 327 | 330 |
| Pelecanus+Nipponia+Egretta (Pelecaniformes) | 13 | 17.94 | 18.27 | 17.93 | 342 | 365 | 349 |
| Pelecanus+Nipponia | 14 | 17.89 | 15.7 | 16.44 | 325 | 312 | 324 |
| Spheniscidae +Fulmarus (Austrodyptornithes) | 15 | 21.64 | 21.33 | 20.98 | 365 | 359 | 393 |
| Aptenodytes+Pygocelis (Spheniscidae) | 16 | 18.4 | 17 | 18.33 | 365 | 355 | 389 |
| Mirandornithes+Charadrius | 17 | 20.6 | 20.1 | 20.09 | 366 | 359 | 367 |
| Podiceps+Phoenicopterus (Mirandornithes) | 18 | 22.08 | 23.1 | 22.1 | 353 | 321 | 359 |
| Afroaves+Opisthocomus | 19 | 16.93 | 18.98 | 19.54 | 334 | 327 | 329 |
| Inopinaves+Coraciimorphae+Tyto+Acciptrimorphae (Afroaves) | 20 | 17.93 | 17.15 | 19.12 | 291 | 273 | 291 |
| Inopinaves+Coraciimorphae+Tyto | 21 | 22.2 | 14.45 | 17.08 | 311 | 319 | 341 |
| Psittacopasserae+Falco+Cariama (Inopinaves) | 22 | 18.63 | 14.76 | 15.6 | 288 | 289 | 295 |
| Psittacopasserae+Falco | 23 | 16.98 | 11.83 | 14.4 | 274 | 269 | 281 |
| Psittaciformes+Passeriformes (Psittacopasserae) | 24 | 15.61 | 8.21 | 12.4 | 266 | 252 | 262 |
| Passeroidea+Corvus+Manacus+Acanthisitta (Passeriformes) | 25 | 10.37 | 8.89 | 10.33 | 281 | 337 | 338 |
| Passeroidea+Corvus+Manacus | 26 | 9.19 | 8.46 | 9.46 | 302 | 354 | 343 |
| Passeroidea+Corvus | 27 | 8.32 | 7.69 | 8.5 | 295 | 307 | 332 |
| Geospiza+Taeniopygia (Passeroidea) | 28 | 9.13 | 9.7 | 9.3 | 358 | 362 | 359 |
| Melopsittacus+Nestor (Psittaciformes) | 29 | 6.89 | 7.1 | 7.58 | 252 | 273 | 297 |
| Coraciimorphae+Tyto | 30 | 15.84 | 13.96 | 14.32 | 286 | 301 | 299 |
| Picoides+Merops+Colius (Coraciimorphae) | 31 | 15.37 | 11.16 | 12.62 | 319 | 347 | 325 |
| Picoides+Merops | 32 | 13.7 | 12.25 | 12.37 | 400 | 435 | 398 |
| Haliaeetus+Cathartes (Acciptrimorphae) | 33 | 21.65 | 22.59 | 22.37 | 337 | 351 | 357 |
| Haliaeetus | 34 | 19.19 | 18 | 19.46 | 361 | 363 | 363 |
| Strisores+Columbaves+Neoaves | 35 | 29.36 | 20.04 | 22.82 | 347 | 341 | 348 |
| Mesitornis+Pterocles+Columba+Cuculus (Columbaves) | 35 | 22.39 | 20.64 | 20.69 | 332 | 344 | 350 |
| Mesitornis+Pterocles+Columba | 36 | 21.35 | 21.34 | 21.04 | 338 | 359 | 353 |
| Mesitornis+Pterocles | 37 | 21.97 | 21.45 | 21.31 | 341 | 354 | 353 |
| Apodiformes+Antrostomus (Strisores) | 38 | 19.31 | 19.57 | 19.65 | 348 | 351 | 352 |
| Chaetura+Calypte (Apodiformes) | 39 | 17.46 | 16.4 | 17.48 | 340 | 338 | 342 |
| Galliformes+Anas (Galloanserae) | 40 | 17.64 | 16.4 | 16.57 | 352 | 357 | 356 |
| Gallus+Meleagris (Galliformes) | 41 | 15.96 | 14.45 | 15.16 | 379 | 411 | 385 |
| Tinamus+Struthio (Palaeognathae) | 42 | 20.22 | 19.35 | 19.42 | 361 | 351 | 362 |

**Supplementary Table S4.** Internal ancestral node estimates of OB ratios and OR gene repertoires for extant taxa, with anomalous species (*Gallus* *gallus*, *Taeniopygia* *guttata*, *Melopsittacus* *undulates*) removed. Information pertaining to what each ancestral node represents is also given. Node numbers correspond to Supplementary Figure 5.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Node description** | **Node** | **Olfactory bulb ratio** | | | **Olfactory receptor gene repertoire** | | |
|  |  | **ML** | **PIC** | **GLS** | **ML** | **PIC** | **GLS** |
| Gallus+Meleagris (Galliformes) | 1 | 27.12 | 25.48 | 25.48 | 413 | 480 | 480 |
| Melopsittacus+Nestor (Psittaciformes) | 2 | 25.66 | 19.21 | 24.82 | 399 | 344 | 466 |
| Geospiza+Taeniopygia (Passeroidea) | 3 | 25.30 | 19.17 | 23.78 | 379 | 342 | 443 |
| Alligator+Aves | 4 | 24.02 | 20.06 | 22.82 | 362 | 346 | 418 |
| Palaeognathae+ Neognathae | 5 | 22.74 | 20.22 | 22.13 | 352 | 347 | 399 |
| Galloanserae+ Strisores+Columbaves+Neoaves (Neognathae) | 6 | 20.97 | 20.07 | 21.41 | 351 | 354 | 383 |
| Strisores+Columbaves+Neoaves | 7 | 21.01 | 19.33 | 21.20 | 351 | 349 | 380 |
| Columbaves+Neoaves | 8 | 18.70 | 19.69 | 19.94 | 351 | 351 | 356 |
| Aequorlitornithes+Afroaves+Opisthocomus+Balearica (Neoaves) | 9 | 18.36 | 19.46 | 19.67 | 346 | 344 | 349 |
| Aequorlitornithes+ Afroaves + Opisthocomus | 10 | 17.72 | 19.25 | 19.54 | 351 | 359 | 352 |
| Aequornithes+Phaethon+Mirandornithes**+**Charadrius(Aequorlitornithes) | 11 | 17.59 | 18.90 | 19.34 | 352 | 354 | 353 |
| Aequornithes+Phaethon | 12 | 18.26 | 16.83 | 17.52 | 356 | 357 | 356 |
| Pelecaniformes+Phalacrocorax+Austrodyptornithes+Gavia (Aequornithes) | 13 | 16.76 | 18.27 | 17.93 | 385 | 411 | 385 |
| Pelecaniformes+Phalacrocorax+Austrodyptornithes | 14 | 15.34 | 15.70 | 16.44 | 364 | 351 | 362 |
| Pelecaniformes+Phalacrocorax | 15 | 20.40 | 21.33 | 20.98 | 352 | 351 | 352 |
| Pelecanus+Nipponia+Egretta (Pelecaniformes) | 16 | 18.42 | 17.00 | 18.33 | 342 | 338 | 342 |
| Pelecanus+Nipponia | 17 | 20.15 | 20.10 | 20.09 | 363 | 363 | 363 |
| Spheniscidae +Fulmarus (Austrodyptornithes) | 18 | 22.46 | 23.10 | 22.10 | 349 | 341 | 348 |
| Aptenodytes+Pygocelis (Spheniscidae) | 19 | 23.54 | 19.04 | 19.60 | 356 | 347 | 355 |
| Mirandornithes**+**Charadrius | 20 | 24.71 | 17.24 | 19.18 | 348 | 305 | 346 |
| Podiceps+Phoenicopterus (Mirandornithes) | 21 | 23.79 | 14.59 | 17.17 | 321 | 294 | 323 |
| Afroaves+Opisthocomus | 22 | 20.10 | 14.97 | 15.77 | 299 | 297 | 306 |
| Inopinaves+Coraciimorphae+Tyto+Acciptrimorphae (Afroaves) | 23 | 16.88 | 12.09 | 14.62 | 295 | 298 | 304 |
| Inopinaves+Coraciimorphae+Tyto | 24 | 13.62 | 8.50 | 12.69 | 275 | 225 | 279 |
| Psittacopasserae+Falco+Cariama (Inopinaves) | 25 | 10.94 | 8.79 | 10.41 | 238 | 217 | 243 |
| Psittacopasserae+Falco | 26 | 8.88 | 8.29 | 9.45 | 228 | 214 | 230 |
| Psittaciformes (Nestor)+Passeriformes (Psittacopasserae) | 27 | 8.28 | 7.35 | 8.40 | 219 | 206 | 218 |
| Passeroidea+Corvus+Manacus+Acanthisitta (Passeriformes) | 28 | 16.82 | 13.96 | 14.33 | 295 | 289 | 293 |
| Passeroidea+Corvus+Manacus | 29 | 14.77 | 11.16 | 12.62 | 281 | 269 | 280 |
| Passeroidea (Geospiza)+Corvus | 30 | 13.21 | 12.25 | 12.37 | 261 | 252 | 261 |
| Coraciimorphae+Tyto | 31 | 23.34 | 22.59 | 22.37 | 326 | 327 | 328 |
| Picoides+Merops+Colius (Coraciimorphae) | 32 | 19.74 | 18.00 | 19.46 | 289 | 273 | 291 |
| Picoides+Merops | 33 | 21.46 | 20.64 | 20.69 | 328 | 327 | 330 |
| Haliaeetus+Cathartes (Acciptrimorphae) | 34 | 20.79 | 21.34 | 21.04 | 349 | 365 | 349 |
| Haliaeetus | 35 | 20.93 | 21.45 | 21.31 | 323 | 312 | 324 |
| Mesitornis+Pterocles+Columba+Cuculus (Columbaves) | 36 | 19.86 | 19.57 | 19.65 | 346 | 345 | 347 |
| Mesitornis+Pterocles+Columba | 37 | 17.37 | 16.40 | 17.48 | 342 | 340 | 342 |
| Mesitornis+Pterocles | 38 | 15.94 | 16.25 | 16.45 | 329 | 329 | 332 |
| Apodiformes+Antrostomus (Strisores) | 39 | 19.55 | 19.35 | 19.42 | 353 | 353 | 354 |

**Supplementary Table S5.** Internal ancestral node repertoire estimates for both extant and extinct taxa using three different methods. Node labels corresponding to the phylogenies displayed in Supplementary Figures S6–8 are also given.

|  |  |  |  |
| --- | --- | --- | --- |
| **Node label** | **ML** | **PIC** | **GLS** |
| **1** | 31.82 | 43.21 | 43.21 |
| **2** | 31.83 | 41.36 | 43.08 |
| **3** | 31.98 | 39.88 | 42.48 |
| **4** | 32.05 | 37.38 | 41.53 |
| **5** | 31.68 | 33.05 | 39.46 |
| **6** | 30.53 | 27.91 | 35.73 |
| **7** | 29.33 | 27.36 | 33.12 |
| **8** | 29.06 | 24.94 | 32.35 |
| **9** | 28.8 | 23.53 | 31.59 |
| **10** | 26.81 | 20.57 | 26.67 |
| **11** | 26.66 | 21.23 | 26.06 |
| **12** | 26.62 | 21.91 | 25.62 |
| **13** | 26.74 | 22.78 | 25.08 |
| **14** | 26.3 | 19.22 | 23.97 |
| **15** | 25.88 | 19.19 | 23.09 |
| **16** | 25.75 | 20.04 | 22.3 |
| **17** | 25.73 | 20.2 | 21.75 |
| **18** | 25.53 | 20.04 | 21.15 |
| **19** | 25.27 | 19.29 | 20.96 |
| **20** | 19.61 | 19.69 | 19.9 |
| **21** | 19.31 | 19.46 | 19.65 |
| **22** | 19.01 | 19.25 | 19.53 |
| **23** | 18.75 | 18.9 | 19.33 |
| **24** | 17.34 | 16.83 | 17.52 |
| **25** | 17.95 | 18.27 | 17.93 |
| **26** | 16.5 | 15.7 | 16.44 |
| **27** | 20.99 | 21.33 | 20.98 |
| **28** | 18.39 | 17 | 18.33 |
| **29** | 20.04 | 20.1 | 20.08 |
| **30** | 22.08 | 23.1 | 22.09 |
| **31** | 22.27 | 18.98 | 19.49 |
| **32** | 21.46 | 17.15 | 19.07 |
| **33** | 17.76 | 14.45 | 17.05 |
| **34** | 14.5 | 14.76 | 15.59 |
| **35** | 13.03 | 11.83 | 14.39 |
| **36** | 11.19 | 8.21 | 12.4 |
| **37** | 9.71 | 8.89 | 10.33 |
| **38** | 9.19 | 8.46 | 9.46 |
| **39** | 8.72 | 7.69 | 8.5 |
| **40** | 9.56 | 9.7 | 9.3 |
| **41** | 7.42 | 7.1 | 7.58 |
| **42** | 14.71 | 13.96 | 14.31 |
| **43** | 12.89 | 11.16 | 12.61 |
| **44** | 12.5 | 12.25 | 12.37 |
| **45** | 22.52 | 22.59 | 22.37 |
| **46** | 19.5 | 18 | 19.46 |
| **47** | 21.05 | 20.64 | 20.68 |
| **48** | 21.25 | 21.34 | 21.04 |
| **49** | 21.4 | 21.45 | 21.31 |
| **50** | 19.66 | 19.57 | 19.64 |
| **51** | 17.46 | 16.4 | 17.48 |
| **52** | 16.53 | 16.4 | 16.55 |
| **53** | 15.11 | 14.45 | 15.15 |
| **54** | 19.44 | 19.35 | 19.41 |
| **55** | 36.97 | 37.1 | 36.96 |
| **56** | 18.3 | 18.2 | 18.28 |
| **57** | 34.81 | 34.47 | 34.37 |
| **58** | 35.09 | 35.18 | 34.69 |
| **59** | 36.92 | 38.06 | 37.05 |
| **60** | 36.06 | 35.85 | 36.25 |
| **61** | 32.07 | 31.65 | 32.08 |
| **62** | 30.26 | 30.34 | 30.45 |
| **63** | 30.8 | 31.3 | 30.91 |
| **64** | 30.53 | 30.4 | 30.57 |
| **65** | 52.9 | 53.45 | 53.12 |
| **66** | 59.83 | 68.33 | 59.88 |
| **67** | 67.8 | 69.75 | 67.78 |
| **68** | 65.58 | 66.9 | 65.5 |
| **69** | 53.61 | 54.87 | 54.64 |
| **70** | 55.48 | 57.39 | 56.12 |
| **71** | 56.32 | 56.85 | 56.61 |
| **72** | 50.65 | 50.7 | 50.6 |
| **73** | 52.04 | 52.65 | 51.97 |
| **74** | 48.02 | 48.06 | 48 |
| **75** | 46.12 | 45.1 | 46.07 |

**Supplementary Table S6.** Inferred repertoire sizes for extinct taxa using various PGLS models and using non-phylogenetically corrected linear regression Mean OB ratios are indicated with ‘\*’. Models with and without the alligator are displayed.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **OB ratio** | **PGLS alligator+Aves, rep= 6.87\*OB+305.20** | **PGLS Aves**  **rep= 5.63\*OB+236.38** | **PGLS alligator+Aves**  **rep= 6.61\*OB+328.33** | **Linear Regression** | | |
| **Fit** | **Lower** | **Upper** |
| **Outlier taxa removed** | | **Outlier taxa included** |
| *Allosaurus fragilis* | 51.6 | 660.0319 | 526.7173 | 669.5696615 | 753.7345 | 455.48464 | 1051.9843 |
| *Allosaurus fragilis* | 50 | 649.0294 | 517.7147 | 658.9884881 | 735.1643 | 441.04301 | 1029.2856 |
| *Allosaurus fragilis\** | 50.8 | 654.5306 | 522.2160 | 664.2790748 | 744.4494 | 448.2818 | 1040.617 |
| *Acrocanthosaurus atokensis* | 58.1 | 704.7297 | 563.2902 | 712.5556786 | 829.1758 | 512.765 | 1145.5866 |
| *Carcharodontosaurus saharicus* | 56 | 690.2889 | 551.4743 | 698.6678884 | 804.8025 | 494.4898 | 1115.1151 |
| *Giganotosaurus carolinii* | 57.7 | 701.9791 | 561.0396 | 709.9103852 | 824.5333 | 509.3 | 1139.7665 |
| *Ceratosaurus magnicornis* | 48.1 | 635.9638 | 507.0242 | 646.4233446 | 713.1122 | 423.7022 | 1002.5223 |
| *Majungasaurus crenatissimus* | 48.3 | 637.3392 | 508.1495 | 647.7459913 | 715.4335 | 425.5376 | 1005.3294 |
| *Dilong paradoxus* | 27 | 490.8678 | 388.3028 | 506.88412 | 468.218 | 214.1662 | 722.2699 |
| *Albertosaurus sarcophagus* | 71 | 793.4378 | 635.8734 | 797.8663893 | 978.8978 | 620.9812 | 1336.8144 |
| *Gorgosaurus libratus* | 68.5 | 776.2463 | 621.8069 | 781.3333059 | 949.8819 | 600.491 | 1299.2729 |
| *Tarbosaurus bataar* | 65.1 | 752.8659 | 602.6764 | 758.8483123 | 910.4203 | 572.2776 | 1248.563 |
| *Tyrannosaurus rex* | 66.5 | 762.4931 | 610.5537 | 768.1068391 | 926.6692 | 583.94542 | 1269.393 |
| *Tyrannosaurus rex* | 71 | 793.4378 | 635.8734 | 797.8663893 | 978.8978 | 620.98125 | 1336.8144 |
| *Tyrannosaurus rex* | 68.3 | 774.871 | 620.6816 | 780.0106592 | 947.5607 | 598.84277 | 1296.2786 |
| *Tyrannosaurus rex\** | 68.7 | 777.6216 | 622.9322 | 782.6559525 | 952.2032 | 602.1379 | 1302.2685 |
| *Garudimimus brevipes* | 28.8 | 503.2456 | 398.4307 | 518.7879401 | 489.1095 | 233.4306 | 744.7884 |
| *Ornithomimus edmontonensis* | 31.4 | 521.1248 | 413.0599 | 535.9823469 | 519.286 | 260.7588 | 777.8133 |
| *Dromiceiomimus brevitertius* | 29.4 | 507.3716 | 401.8067 | 522.7558801 | 496.0733 | 239.7889 | 752.3578 |
| *Struthiomimus altus* | 32.5 | 528.689 | 419.2491 | 543.2569037 | 532.053 | 272.1475 | 791.9586 |
| *Citipati osmolskae* | 31.5 | 521.8124 | 413.6225 | 536.6436703 | 520.4467 | 261.7983 | 779.095 |
| *Saurornitholestes langstoni* | 34.8 | 544.5052 | 432.1903 | 558.4673405 | 558.7476 | 295.6369 | 821.8584 |
| *Bambiraptor feinbergi* | 28.5 | 501.1827 | 396.7427 | 516.8039701 | 485.6276 | 230.2397 | 741.0155 |
| *Velociraptor mongoliensis* | 35.7 | 550.6941 | 437.2543 | 564.4192505 | 569.1934 | 304.712 | 833.6747 |
| *Troodon formosus* | 33.2 | 533.5026 | 423.1878 | 547.886167 | 540.1775 | 279.34231 | 801.0126 |
| *Troodon formosus* | 33.5 | 535.5656 | 424.8757 | 549.8701371 | 543.6594 | 282.41344 | 804.9053 |
| *Troodon formosus* | 32.6 | 529.3767 | 419.8118 | 543.918227 | 533.2137 | 273.17779 | 793.2495 |
| *Troodon formosus* | 33 | 532.1273 | 422.0624 | 546.5635204 | 537.8562 | 277.29078 | 798.4216 |
| *Troodon formosus\** | 33.1 | 532.815 | 422.6251 | 547.2248437 | 539.0168 | 278.317 | 799.7167 |
| *Archaeopteryx lithographica* | 17.1 | 422.7895 | 332.5994 | 441.4131094 | 353.3151 | 102.9525 | 603.6776 |
| *Confuciusornis sanctus* | 17.9 | 428.2908 | 337.1007 | 446.7036961 | 362.6002 | 112.2763 | 612.9241 |
| *Hesperornis regalis* | 15.3 | 410.4117 | 322.4715 | 429.5092893 | 332.4236 | 81.75645 | 583.0908 |
| *Hesperornis regalis* | 21.3 | 451.6712 | 356.2312 | 469.1886897 | 402.0618 | 151.23762 | 652.886 |
| *Hesperornis regalis\** | 18.3 | 431.0414 | 339.3513 | 449.3489895 | 367.2427 | 116.9158 | 617.5697 |
| *Ichthyornis dispar* | 18.1 | 429.6661 | 338.226 | 448.0263428 | 364.9214 | 114.5979 | 615.245 |
| *Lithornis plebius* | 36.5 | 556.1954 | 441.7555 | 569.7098372 | 578.4785 | 312.7251 | 844.2318 |
| *Lithornis promiscuus* | 37.7 | 564.4473 | 448.5075 | 577.6457173 | 592.4061 | 324.6515 | 860.1607 |
| *Deinonychus antirrhopus* | 41 | 587.14 | 467.0753 | 599.4693875 | 630.7071 | 356.8918 | 904.5223 |
| *Tsaagan mangas* | 36 | 552.7571 | 438.9422 | 566.4032206 | 572.6753 | 307.7228 | 837.6277 |
| *Viavenator exxoni* | 57 | 697.1655 | 557.1009 | 705.2811218 | 816.4088 | 503.2184 | 1129.5992 |
| *Erlikosaurus andrewsi* | 40 | 580.2635 | 461.4487 | 592.8561541 | 619.1007 | 347.2063 | 890.9951 |
| *Euoplocephalus sp* | 52 | 662.7825 | 528.9679 | 672.2149549 | 758.377 | 459.0728 | 1057.6813 |
| *Pawpawsaurus campbelli* | 46.2 | 622.8983 | 496.3336 | 633.8582012 | 691.0601 | 406.1437 | 975.9766 |
| *Panoplosaurus mirus* | 44 | 607.7698 | 483.9551 | 619.3090877 | 665.5261 | 385.5273 | 945.525 |

**Supplementary Table S7.** Representative reptilian OR genes used to find orthologous sequences in bird genomes, using 65% identity as a threshold.

|  |  |
| --- | --- |
| **Olfactory Receptor** | **Source** |
| XM\_006035034.1 PREDICTED: Alligator sinensis olfactory receptor 4E1 | RefSeq  [1] |
| XM\_006039314.1 PREDICTED: Alligator sinensis olfactory receptor 52L1 |
| XM\_006032220.2 PREDICTED: Alligator sinensis olfactory receptor 1052 |
| XM\_006032219.1 PREDICTED: Alligator sinensis olfactory receptor 1052 |
| XM\_014526796.1 PREDICTED: Alligator sinensis olfactory receptor 2AP1 |
| XM\_006038492.1 PREDICTED: Alligator sinensis olfactory receptor 6B1 |
| XM\_014527740.1 PREDICTED: Alligator sinensis olfactory receptor 6C75 |
| XM\_006038961.2 PREDICTED: Alligator sinensis olfactory receptor 10A2 |
| XM\_014527570.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 |
| XM\_006035991.2 PREDICTED: Alligator sinensis olfactory receptor 10A5 |
| XM\_014527671.1 PREDICTED: Alligator sinensis olfactory receptor 10A3 |
| XM\_006034106.2 PREDICTED: Alligator sinensis olfactory receptor 6 |
| XM\_006039013.2 PREDICTED: Alligator sinensis olfactory receptor 14A16 |
| XM\_006034107.1 PREDICTED: Alligator sinensis olfactory receptor 12 |
| XM\_006035018.1 PREDICTED: Alligator sinensis olfactory receptor 6C4 |
| XM\_006036718.1 PREDICTED: Alligator sinensis olfactory receptor 52B2 |
| XM\_006032241.2 PREDICTED: Alligator sinensis olfactory receptor 2G3 |
| XM\_006031572.2 PREDICTED: Alligator sinensis olfactory receptor 5B21 |
| XM\_006032244.1 PREDICTED: Alligator sinensis olfactory receptor 1052 |
| XM\_014524909.1 PREDICTED: Alligator sinensis olfactory receptor 6P1 |
| XM\_006035017.1 PREDICTED: Alligator sinensis olfactory receptor 6C4 |
| XM\_006032228.2 PREDICTED: Alligator sinensis olfactory receptor 5AR1 |
| XM\_006036717.1 PREDICTED: Alligator sinensis olfactory receptor 52D1 |
| XM\_006032217.1 PREDICTED: Alligator sinensis olfactory receptor 1019 |
| XM\_014526923.1 PREDICTED: Alligator sinensis olfactory receptor 51Q1 |
| XM\_006037936.1 PREDICTED: Alligator sinensis olfactory receptor 51G2 |
| XM\_006036778.1 PREDICTED: Alligator sinensis olfactory receptor 1020 |
| XM\_006032087.1 PREDICTED: Alligator sinensis olfactory receptor 52R1 |
| XM\_014523915.1 PREDICTED: Alligator sinensis olfactory receptor 51S1 |
| XM\_006032091.1 PREDICTED: Alligator sinensis olfactory receptor 51L1 |
| XM\_006035000.1 PREDICTED: Alligator sinensis olfactory receptor 4E1 |
| XM\_006039093.1 PREDICTED: Alligator sinensis olfactory receptor 12D2 |
| XM\_014524856.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 |
| XM\_006036061.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 |
| XM\_006037726.1 PREDICTED: Alligator sinensis olfactory receptor 4N2 |
| XM\_006038500.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 |
| XM\_006032092.1 PREDICTED: Alligator sinensis olfactory receptor 51E2 |
| XM\_006033957.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 |
| XM\_006034122.1 PREDICTED: Alligator sinensis olfactory receptor 6N1 |
| XM\_014526782.1 PREDICTED: Alligator sinensis olfactory receptor 10T2 |
| XM\_006032221.2 PREDICTED: Alligator sinensis olfactory receptor COR8 |
| XM\_006034790.2 PREDICTED: Alligator sinensis olfactory receptor COR4 |
| XM\_014523649.1 PREDICTED: Alligator sinensis olfactory receptor 10A7 |
| XM\_014523977.1 PREDICTED: Alligator sinensis olfactory receptor 1019 |
| XM\_014526594.1 PREDICTED: Alligator sinensis olfactory receptor 52A5 |
| XM\_006032247.1 PREDICTED: Alligator sinensis olfactory receptor 1009 |
| XM\_006020988.2 PREDICTED: Alligator sinensis olfactory receptor 2A5 |
| XM\_006039254.1 PREDICTED: Alligator sinensis olfactory receptor 10A7 |
| XM\_006031595.1 PREDICTED: Alligator sinensis olfactory receptor 6M1 |
| XM\_006039174.1 PREDICTED: Alligator sinensis olfactory receptor 4D9 |
| XM\_006034999.1 PREDICTED: Alligator sinensis olfactory receptor 49 |
| XM\_006031590.2 PREDICTED: Alligator sinensis olfactory receptor 1052 |
| XM\_014527682.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 |
| XM\_006032090.2 PREDICTED: Alligator sinensis olfactory receptor 51G2 |
| XM\_006039094.1 PREDICTED: Alligator sinensis olfactory receptor 12D3 |
| XM\_014524214.1 PREDICTED: Alligator sinensis olfactory receptor 10R2 |
| XM\_006039141.1 PREDICTED: Alligator sinensis olfactory receptor 6X1 |
| XM\_006032222.1 PREDICTED: Alligator sinensis olfactory receptor 1052 |
| XM\_006032242.1 PREDICTED: Alligator sinensis olfactory receptor 1013 |
| XM\_006034789.1 PREDICTED: Alligator sinensis olfactory receptor 1019 |
| XM\_006039298.1 PREDICTED: Alligator sinensis olfactory receptor 12D2 |
| XM\_014525901.1 PREDICTED: Alligator sinensis olfactory receptor 1019 |
| XM\_014526945.1 PREDICTED: Alligator sinensis olfactory receptor 10A7 |
| XM\_006033958.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 |
| XM\_014527719.1 PREDICTED: Alligator sinensis olfactory receptor 4D9 |
| XM\_006036686.1 PREDICTED: Alligator sinensis olfactory receptor 2AT4 |
| XM\_006037243.2 PREDICTED: Alligator sinensis olfactory receptor 6X1 |
| XM\_014526109.1 PREDICTED: Alligator sinensis olfactory receptor 14A16 |
| XM\_006036787.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 |
| XM\_014527787.1 PREDICTED: Alligator sinensis olfactory receptor 52R1 |
| XM\_006039137.2 PREDICTED: Alligator sinensis olfactory receptor 5V1 |
| XM\_006035034.1 PREDICTED: Alligator sinensis olfactory receptor 4E1 |
| XM\_014604867.2 PREDICTED: Alligator mississippiensis olfactory receptor COR4 | RefSeq [2] |
| XM\_019478665.1 PREDICTED: Alligator mississippiensis olfactory receptor 9G4 |
| XM\_019488518.1 PREDICTED: Alligator mississippiensis olfactory receptor 2A12 |
| XM\_014597746.1 PREDICTED: Alligator mississippiensis olfactory receptor 11A1 |
| XM\_006269294.2 PREDICTED: Alligator mississippiensis olfactory receptor 1009 |
| XM\_014611427.1 PREDICTED: Alligator mississippiensis olfactory receptor 49 |
| XM\_019499955.1 PREDICTED: Alligator mississippiensis olfactory receptor 10AC1 |
| XM\_006278564.2 PREDICTED: Alligator mississippiensis olfactory receptor 2A5 |
| XM\_006274969.2 PREDICTED: Alligator mississippiensis olfactory receptor 10T2 |
| XM\_014594828.1 PREDICTED: Alligator mississippiensis olfactory receptor 10A4 |
| XM\_014597745.1 PREDICTED: Alligator mississippiensis olfactory receptor 1440 |
| XM\_019482376.1 PREDICTED: Alligator mississippiensis olfactory receptor 52A5 |
| XM\_006260764.3 PREDICTED: Alligator mississippiensis olfactory receptor 1052 |
| XM\_006269293.1 PREDICTED: Alligator mississippiensis olfactory receptor 11A1 |
| XM\_006271879.2 PREDICTED: Alligator mississippiensis olfactory receptor 10H1 |
| XM\_006262992.2 PREDICTED: Alligator mississippiensis olfactory receptor 51G2 |
| XM\_006267750.2 PREDICTED: Alligator mississippiensis olfactory receptor 2G3 |
| XM\_006268318.2 PREDICTED: Alligator mississippiensis olfactory receptor 10C1 |
| XM\_014609974.2 PREDICTED: Alligator mississippiensis olfactory receptor 4N2 |
| XM\_019489818.1 PREDICTED: Alligator mississippiensis olfactory receptor 6F1 |
| XM\_006262994.2 PREDICTED: Alligator mississippiensis olfactory receptor 51Q1 |
| XM\_014597747.1 PREDICTED: Alligator mississippiensis olfactory receptor 6A2 |
| XM\_014611430.1 PREDICTED: Alligator mississippiensis olfactory receptor 6M1 |
| XM\_019489814.1 PREDICTED: Alligator mississippiensis olfactory receptor 6B1 |
| XM\_006258018.2 PREDICTED: Alligator mississippiensis olfactory receptor 4M1 |
| XM\_006262993.2 PREDICTED: Alligator mississippiensis olfactory receptor 51I2 |
| XM\_006263697.2 PREDICTED: Alligator mississippiensis olfactory receptor 51I2 |
| XM\_006268307.3 PREDICTED: Alligator mississippiensis olfactory receptor 10A4 |
| XM\_006263040.1 PREDICTED: Alligator mississippiensis olfactory receptor 1038 |
| XM\_006259095.1 PREDICTED: Alligator mississippiensis olfactory receptor 4D9 |
| XM\_006260759.1 PREDICTED: Alligator mississippiensis olfactory receptor 1019 |
| XM\_006267538.1 PREDICTED: Alligator mississippiensis olfactory receptor 1019 |
| XM\_006268320.1 PREDICTED: Alligator mississippiensis olfactory receptor 10A7 |
| XM\_014595168.1 PREDICTED: Alligator mississippiensis olfactory receptor 2A12 |
| XM\_006278509.1 PREDICTED: Alligator mississippiensis olfactory receptor 4N5 |
| XM\_014594485.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 |
| XM\_006268319.1 PREDICTED: Alligator mississippiensis olfactory receptor 10C1 |
| XM\_006265550.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 |
| XM\_006278498.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 |
| XM\_006278500.2 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 |
| XM\_019486358.1 PREDICTED: Alligator mississippiensis olfactory receptor 12D1 |
| XM\_019496768.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 |
| XM\_019496752.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 |
| XM\_005311793.2 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | RefSeq [3] |
| XM\_008175041.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4D5 |
| XM\_008176388.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 |
| XM\_008175039.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 |
| XM\_008175031.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_005309244.2 PREDICTED: Chrysemys picta bellii olfactory receptor 1468 |
| XM\_008174413.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14I1 |
| XM\_005289441.2 PREDICTED: Chrysemys picta bellii olfactory receptor 2AT4 |
| XM\_008175033.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A4 |
| XM\_005309234.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_008175027.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5 |
| XM\_005314359.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52E4 |
| XM\_008178121.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1019 |
| XM\_008174412.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4D2 |
| XM\_008168738.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 |
| XM\_005310841.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5V1 |
| XM\_005310413.1 PREDICTED: Chrysemys picta bellii olfactory receptor 12D2 |
| XM\_008168730.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 |
| XM\_008178018.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52K1 |
| XM\_008175965.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1009 |
| XM\_005311801.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 |
| XM\_008177963.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1019 |
| XM\_005312774.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4N2 |
| XM\_008175572.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 |
| XM\_005309056.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_008177588.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 |
| XM\_008175561.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 |
| XM\_005313796.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6C75 |
| XM\_008174336.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_008174338.1 PREDICTED: Chrysemys picta bellii olfactory receptor 12D2 |
| XM\_005310393.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_005310272.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_005310292.2 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 |
| XM\_005310408.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_008171713.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1019 |
| XM\_005310400.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10C1 |
| XM\_008177751.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_005309045.2 PREDICTED: Chrysemys picta bellii olfactory receptor 12 |
| XM\_008175036.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_008176638.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4Q2 |
| XM\_005309255.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 |
| XM\_005310439.2 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 |
| XM\_008174340.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_005290034.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 |
| XM\_005310406.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A7 |
| XM\_005314585.2 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 |
| XM\_005309064.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10AG1 |
| XM\_005314320.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_005311899.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_005290011.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 |
| XM\_005309043.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6P1 |
| XM\_005309055.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_005310422.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_008174332.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_008177992.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A7 |
| XM\_005309019.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1020 |
| XM\_005313885.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52K2 |
| XM\_005310280.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 |
| XM\_008174321.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_005309024.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10C1 |
| XM\_005311817.2 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 |
| XM\_005312282.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5V1 |
| XM\_005290052.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 |
| XM\_005313248.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52R1 |
| XM\_008178061.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52P1 |
| XM\_005314254.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_008174690.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_005310270.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_005309010.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A4 |
| XM\_005313793.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6C4 |
| XM\_005284256.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_008177186.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_005290036.2 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 |
| XM\_008177901.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51E2 |
| XM\_005309014.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A4 |
| XM\_005310433.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5V1 |
| XM\_005312401.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 |
| XM\_008174396.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4M1 |
| XM\_005311794.2 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 |
| XM\_005310423.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 |
| XM\_008174324.1 PREDICTED: Chrysemys picta bellii olfactory receptor 476 |
| XM\_008177669.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B6 |
| XM\_008174403.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4D9 |
| XM\_008177073.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 |
| XM\_005309054.2 PREDICTED: Chrysemys picta bellii olfactory receptor 1038 |
| XM\_005309062.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11L1 |
| XM\_008177845.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52K1 |
| XM\_005309038.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 |
| XM\_005310284.2 PREDICTED: Chrysemys picta bellii olfactory receptor 1038 |
| Pm066 | [4] |
| Pm091 |
| Pm010 |
| Pm120 |
| Pm047 |
| Pm068 |
| Pm020 |
| Pm046 |
| Pm055 |
| Pm136 |
| Pm045 |
| Pm148 |
| Pm070 |
| Pm119 |
| Pm014 |
| Pm053 |
| Pm030 |
| Pm036 |
| Pm049 |
| Pm088 |
| Pm115 |
| Pm005 |
| Pm132 |
| Pm057 |
| Pm123 |
| Pm004 |
| Pm096 |
| Pm023 |
| Pm054 |
| Pm155\_P |
| Pm171\_T |
| Pm207\_T |
| Pm213\_T |
| Pm223\_T |
| Pm222\_T |
| Pm209\_T |
| Pm248\_T |
| Pm250\_T |
| Pm271\_T |
| Pm275\_T |
| Pm277\_T |
| Pm184\_T |
| Pm195\_T |
| Pm188\_T |
| Pm243\_T |
| Pm219\_T |
| Pm279\_T |
| Pm178\_T |
| Pm252\_T |
| Pm204\_T |
| Ac93 |
| Ac89 |
| Ac75 |
| Ac109 |
| Ac110 |
| Ac52 |
| Ac98 |
| Ac106 |
| Ac131 |
| Ac59 |
| Ac3 |
| Ac91 |
| Ac125 |
| Ac112 |
| Ac119 |
| Ac44 |
| Ac103 |
| Ac27 |
| Ac20 |
| Ac37 |
| Ac87 |
| Ac81 |

**Supplementary Table S8.** Query reptilian OR genes were used to find orthologs in birds with 65% shared amino acid identity. The query, orthologs, sequence lengths and shared identities for all sequences used are displayed.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Query Reptile sequence** | **Length**  **(amino acids)** | **Bird orthologs** | **Shared amino acids** | **Bird OR length** | **% identity** |
| XM\_006035034.1 PREDICTED: Alligator sinensis olfactory receptor 4E1 | 377 | Struthio camelus OR4 | 207 | 300 | 69% |
| XM\_006039314.1 PREDICTED: Alligator sinensis olfactory receptor 52L1 | 229 | Struthio camelus OR52 | 130 | 178 | 73% |
| XM\_006032220.2 PREDICTED: Alligator sinensis olfactory receptor 1052 | 375 | Anas platyrhynchos OR5 | 221 | 305 | 72% |
| XM\_006032219.1 PREDICTED: Alligator sinensis olfactory receptor 1052 | 370 | Anas platyrhynchos OR5 | 201 | 305 | 66% |
| XM\_014526796.1 PREDICTED: Alligator sinensis olfactory receptor 2AP1 | 367 | Aptenodytes forsteri OR10 | 200 | 307 | 65% |
| XM\_006038492.1 PREDICTED: Alligator sinensis olfactory receptor 6B1 | 364 | Cathartes aura OR6 | 249 | 307 | 81% |
| XM\_014527740.1 PREDICTED: Alligator sinensis olfactory receptor 6C75 | 360 | Fulmarus glacialis OR6 | 210 | 300 | 70% |
| XM\_006038961.2 PREDICTED: Alligator sinensis olfactory receptor 10A2 | 562 | Pterocles gutturalis OR10 | 212 | 294 | 72% |
| XM\_014527570.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 | 355 | Nestor notabilis OR6 | 212 | 306 | 69% |
| XM\_006035991.2 PREDICTED: Alligator sinensis olfactory receptor 10A5 | 348 | Tinamus guttatus OR10 | 184 | 270 | 68% |
| XM\_014527671.1 PREDICTED: Alligator sinensis olfactory receptor 10A3 | 346 | Charadrius vociferus OR10 | 189 | 270 | 70% |
| XM\_006034106.2 PREDICTED: Alligator sinensis olfactory receptor 6 | 344 | Antrostomus carolinensis OR6 Pseudogene | 139 | 215 | 65% |
| XM\_006039013.2 PREDICTED: Alligator sinensis olfactory receptor 14A16 | 344 | Nipponia nippon OR14 | 200 | 307 | 65% |
| XM\_006034107.1 PREDICTED: Alligator sinensis olfactory receptor 12 | 342 | Balearica regulorum OR14 | 223 | 308 | 72% |
| XM\_006035018.1 PREDICTED: Alligator sinensis olfactory receptor 6C4 | 342 | Charadrius vociferus OR6 | 217 | 308 | 70% |
| XM\_006036718.1 PREDICTED: Alligator sinensis olfactory receptor 52B2 | 342 | Meleagris gallopavo OR52 | 213 | 304 | 70% |
| XM\_006032241.2 PREDICTED: Alligator sinensis olfactory receptor 2G3 | 337 | Cathartes aura OR13 | 228 | 309 | 74% |
| XM\_006031572.2 PREDICTED: Alligator sinensis olfactory receptor 5B21 | 510 | Phoenicopterus ruber OR13 | 197 | 304 | 65% |
| XM\_006032244.1 PREDICTED: Alligator sinensis olfactory receptor 1052 | 336 | Charadrius vociferus OR5 | 208 | 311 | 67% |
| XM\_014524909.1 PREDICTED: Alligator sinensis olfactory receptor 6P1 | 336 | Aptenodytes forsteri OR5 | 187 | 273 | 68% |
| XM\_006035017.1 PREDICTED: Alligator sinensis olfactory receptor 6C4 | 334 | Nipponia nippon OR6 | 205 | 300 | 68% |
| XM\_006032228.2 PREDICTED: Alligator sinensis olfactory receptor 5AR1 | 333 | Cathartes aura OR5 | 241 | 313 | 77% |
| XM\_006036717.1 PREDICTED: Alligator sinensis olfactory receptor 52D1 | 333 | Struthio camelus OR52 | 217 | 303 | 72% |
| XM\_006032217.1 PREDICTED: Alligator sinensis olfactory receptor 1019 | 332 | Fulmarus glacialis OR5 | 221 | 307 | 72% |
| XM\_014526923.1 PREDICTED: Alligator sinensis olfactory receptor 51Q1 | 330 | Columba livia OR51 | 203 | 305 | 67% |
| XM\_006037936.1 PREDICTED: Alligator sinensis olfactory receptor 51G2 | 328 | Tinamus guttatus OR51 | 171 | 225 | 76% |
| XM\_006036778.1 PREDICTED: Alligator sinensis olfactory receptor 1020 | 477 | Phaeton lepturus OR10 | 209 | 313 | 67% |
| XM\_006032087.1 PREDICTED: Alligator sinensis olfactory receptor 52R1 | 325 | Gavia stellata OR52 | 224 | 308 | 73% |
| XM\_014523915.1 PREDICTED: Alligator sinensis olfactory receptor 51S1 | 325 | Struthio camelus OR51 Pseudogene | 142 | 200 | 71% |
| XM\_006032091.1 PREDICTED: Alligator sinensis olfactory receptor 51L1 | 324 | Struthio camelus OR51 | 195 | 298 | 65% |
| XM\_006035000.1 PREDICTED: Alligator sinensis olfactory receptor 4E1 | 459 | Struthio camelus OR4 | 243 | 301 | 81% |
| XM\_006039093.1 PREDICTED: Alligator sinensis olfactory receptor 12D2 | 322 | Cariama cristata OR12 | 230 | 309 | 74% |
| XM\_014524856.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 | 321 | Phaeton lepturus OR4 | 201 | 309 | 65% |
| XM\_006036061.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 | 320 | Gavia stellata OR4 | 211 | 312 | 68% |
| XM\_006037726.1 PREDICTED: Alligator sinensis olfactory receptor 4N2 | 320 | Cathartes aura OR4 | 227 | 320 | 71% |
| XM\_006038500.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 | 433 | Cuculus canorus OR5 | 206 | 310 | 66% |
| XM\_006032092.1 PREDICTED: Alligator sinensis olfactory receptor 51E2 | 319 | Phaeton lepturus OR51 | 241 | 319 | 76% |
| XM\_006033957.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 | 319 | Struthio camelus OR4 | 226 | 307 | 74% |
| XM\_006034122.1 PREDICTED: Alligator sinensis olfactory receptor 6N1 | 319 | Gavia stellata OR10 | 259 | 307 | 84% |
| XM\_014526782.1 PREDICTED: Alligator sinensis olfactory receptor 10T2 | 430 | Charadrius vociferus OR10 | 215 | 307 | 70% |
| XM\_006032221.2 PREDICTED: Alligator sinensis olfactory receptor COR8 | 318 | Gallus gallus OR5 | 230 | 315 | 73% |
| XM\_006034790.2 PREDICTED: Alligator sinensis olfactory receptor COR4 | 318 | Phaeton lepturus OR5 | 215 | 308 | 70% |
| XM\_014523649.1 PREDICTED: Alligator sinensis olfactory receptor 10A7 | 318 | Nipponia nippon OR5 | 201 | 306 | 66% |
| XM\_014523977.1 PREDICTED: Alligator sinensis olfactory receptor 1019 | 318 | Anas platyrhynchos OR5 | 200 | 309 | 65% |
| XM\_014526594.1 PREDICTED: Alligator sinensis olfactory receptor 52A5 | 318 | Struthio camelus OR52 | 212 | 316 | 67% |
| XM\_006032247.1 PREDICTED: Alligator sinensis olfactory receptor 1009 | 317 | Tyto alba OR5 | 202 | 308 | 66% |
| XM\_006020988.2 PREDICTED: Alligator sinensis olfactory receptor 2A5 | 316 | Struthio camelus OR2 | 238 | 303 | 79% |
| XM\_006039254.1 PREDICTED: Alligator sinensis olfactory receptor 10A7 | 421 | Tinamus guttatus OR10 | 196 | 301 | 65% |
| XM\_006031595.1 PREDICTED: Alligator sinensis olfactory receptor 6M1 | 316 | Opisthocomus hoazin OR6 | 208 | 316 | 66% |
| XM\_006039174.1 PREDICTED: Alligator sinensis olfactory receptor 4D9 | 316 | Pterocles gutturalis OR4 | 206 | 314 | 66% |
| XM\_006034999.1 PREDICTED: Alligator sinensis olfactory receptor 49 | 316 | Nipponia nippon OR6 | 214 | 307 | 70% |
| XM\_006031590.2 PREDICTED: Alligator sinensis olfactory receptor 1052 | 419 | Balearica regulorum OR13 | 189 | 283 | 67% |
| XM\_014527682.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 | 315 | Tinamus guttatus OR6 | 227 | 310 | 73% |
| XM\_006032090.2 PREDICTED: Alligator sinensis olfactory receptor 51G2 | 314 | Struthio camelus OR51 | 249 | 303 | 82% |
| XM\_006039094.1 PREDICTED: Alligator sinensis olfactory receptor 12D3 | 314 | Cariama cristata OR12 | 230 | 314 | 73% |
| XM\_014524214.1 PREDICTED: Alligator sinensis olfactory receptor 10R2 | 314 | Balearica regulorum OR10 | 211 | 298 | 71% |
| XM\_006039141.1 PREDICTED: Alligator sinensis olfactory receptor 6X1 | 409 | Fulmarus glacialis OR6 | 153 | 231 | 66% |
| XM\_006032222.1 PREDICTED: Alligator sinensis olfactory receptor 1052 | 313 | Struthio camelus OR5 | 225 | 311 | 72% |
| XM\_006032242.1 PREDICTED: Alligator sinensis olfactory receptor 1013 | 313 | Gavia stellata OR9 | 222 | 312 | 71% |
| XM\_006034789.1 PREDICTED: Alligator sinensis olfactory receptor 1019 | 313 | Fulmarus glacialis OR5 | 218 | 311 | 70% |
| XM\_006039298.1 PREDICTED: Alligator sinensis olfactory receptor 12D2 | 313 | Cariama cristata OR12 | 210 | 309 | 68% |
| XM\_014525901.1 PREDICTED: Alligator sinensis olfactory receptor 1019 | 313 | Struthio camelus OR5 | 234 | 311 | 75% |
| XM\_014526945.1 PREDICTED: Alligator sinensis olfactory receptor 10A7 | 313 | Tinamus guttatus OR10 | 223 | 301 | 74% |
| XM\_006033958.1 PREDICTED: Alligator sinensis olfactory receptor 4S2 | 403 | Gavia stellata OR4 | 262 | 312 | 84% |
| XM\_014527719.1 PREDICTED: Alligator sinensis olfactory receptor 4D9 | 400 | Geospiza fortis OR4 | 203 | 303 | 67% |
| XM\_006036686.1 PREDICTED: Alligator sinensis olfactory receptor 2AT4 | 396 | Nipponia nippon OR2 | 231 | 312 | 74% |
| XM\_006037243.2 PREDICTED: Alligator sinensis olfactory receptor 6X1 | 311 | Aptenodytes forsteri OR2 | 217 | 309 | 70% |
| XM\_014526109.1 PREDICTED: Alligator sinensis olfactory receptor 14A16 | 307 | Columba livia OR14 | 203 | 306 | 66% |
| XM\_006036787.1 PREDICTED: Alligator sinensis olfactory receptor 6F1 | 298 | Cathartes aura OR6 | 195 | 299 | 65% |
| XM\_014527787.1 PREDICTED: Alligator sinensis olfactory receptor 52R1 | 277 | Gavia stellata OR52 | 164 | 224 | 73% |
| XM\_006039137.2 PREDICTED: Alligator sinensis olfactory receptor 5V1 | 261 | Aptenodytes forsteri OR10 | 131 | 203 | 65% |
| XM\_006035034.1 PREDICTED: Alligator sinensis olfactory receptor 4E1 | 377 | Struthio camelus OR4 | 207 | 300 | 69% |
| XM\_014604867.2 PREDICTED: Alligator mississippiensis olfactory receptor COR4 | 334 | Gallus gallus OR5 | 201 | 305 | 66% |
| XM\_019478665.1 PREDICTED: Alligator mississippiensis olfactory receptor 9G4 | 160 | Phoenicopterus ruber OR6 | 68 | 93 | 73% |
| XM\_019488518.1 PREDICTED: Alligator mississippiensis olfactory receptor 2A12 | 363 | Fulmarus glacialis OR2 | 200 | 305 | 66% |
| XM\_014597746.1 PREDICTED: Alligator mississippiensis olfactory receptor 11A1 | 357 | Phoenicopterus ruber OR6 | 205 | 306 | 67% |
| XM\_006269294.2 PREDICTED: Alligator mississippiensis olfactory receptor 1009 | 353 | Nipponia nippon OR5 | 200 | 310 | 65% |
| XM\_014611427.1 PREDICTED: Alligator mississippiensis olfactory receptor 49 | 331 | Fulmarus glacialis OR6 | 215 | 324 | 66% |
| XM\_019499955.1 PREDICTED: Alligator mississippiensis olfactory receptor 10AC1 | 331 | Podiceps cristatus OR10 | 245 | 326 | 75% |
| XM\_006278564.2 PREDICTED: Alligator mississippiensis olfactory receptor 2A5 | 328 | Charadrius vociferus OR2 | 205 | 306 | 67% |
| XM\_006274969.2 PREDICTED: Alligator mississippiensis olfactory receptor 10T2 | 326 | Charadrius vociferus OR10 | 229 | 303 | 76% |
| XM\_006274969.2 PREDICTED: Alligator mississippiensis olfactory receptor 10T2 | 326 | Charadrius vociferus OR10 | 229 | 303 | 76% |
| XM\_014594828.1 PREDICTED: Alligator mississippiensis olfactory receptor 10A4 | 326 | Charadrius vociferus OR10 | 216 | 308 | 70% |
| XM\_014597745.1 PREDICTED: Alligator mississippiensis olfactory receptor 1440 | 325 | Phoenicopterus ruber OR10 | 164 | 247 | 66% |
| XM\_019482376.1 PREDICTED: Alligator mississippiensis olfactory receptor 52A5 | 469 | Struthio camelus OR52 | 195 | 279 | 70% |
| XM\_006260764.3 PREDICTED: Alligator mississippiensis olfactory receptor 1052 | 324 | Anas platyrhynchos OR5 | 205 | 305 | 67% |
| XM\_006269293.1 PREDICTED: Alligator mississippiensis olfactory receptor 11A1 | 324 | Fulmarus glacialis OR10 | 146 | 226 | 65% |
| XM\_006271879.2 PREDICTED: Alligator mississippiensis olfactory receptor 10H1 | 324 | Haliaeetus leucocephalus OR10 | 200 | 308 | 65% |
| XM\_006262992.2 PREDICTED: Alligator mississippiensis olfactory receptor 51G2 | 322 | Tinamus guttatus OR51 | 231 | 318 | 73% |
| XM\_006267750.2 PREDICTED: Alligator mississippiensis olfactory receptor 2G3 | 321 | Melopsittacus undulatus OR10 | 197 | 303 | 65% |
| XM\_006268318.2 PREDICTED: Alligator mississippiensis olfactory receptor 10C1 | 321 | Cathartes aura OR10 | 237 | 316 | 75% |
| XM\_014609974.2 PREDICTED: Alligator mississippiensis olfactory receptor 4N2 | 320 | Cathartes aura OR4 | 235 | 312 | 75% |
| XM\_019489818.1 PREDICTED: Alligator mississippiensis olfactory receptor 6F1 | 320 | Aptenodytes forsteri OR4 | 208 | 303 | 69% |
| XM\_006262994.2 PREDICTED: Alligator mississippiensis olfactory receptor 51Q1 | 318 | Columba livia OR51 | 226 | 303 | 75% |
| XM\_014597747.1 PREDICTED: Alligator mississippiensis olfactory receptor 6A2 | 318 | Nipponia nippon OR6 | 209 | 318 | 66% |
| XM\_014611430.1 PREDICTED: Alligator mississippiensis olfactory receptor 6M1 | 318 | Pygoscelis adeliae OR6 | 227 | 313 | 73% |
| XM\_019489814.1 PREDICTED: Alligator mississippiensis olfactory receptor 6B1 | 318 | Fulmarus glacialis OR10 | 148 | 227 | 65% |
| XM\_006258018.2 PREDICTED: Alligator mississippiensis olfactory receptor 4M1 | 315 | Pterocles gutturalis OR4 | 215 | 309 | 70% |
| XM\_006262993.2 PREDICTED: Alligator mississippiensis olfactory receptor 51I2 | 315 | Struthio camelus OR51 | 242 | 309 | 78% |
| XM\_006263697.2 PREDICTED: Alligator mississippiensis olfactory receptor 51I2 | 315 | Struthio camelus OR51 | 214 | 309 | 69% |
| XM\_006268307.3 PREDICTED: Alligator mississippiensis olfactory receptor 10A4 | 315 | Tinamus guttatus OR10 | 189 | 270 | 70% |
| XM\_006263040.1 PREDICTED: Alligator mississippiensis olfactory receptor 1038 | 314 | Struthio camelus OR5 | 234 | 307 | 76% |
| XM\_006259095.1 PREDICTED: Alligator mississippiensis olfactory receptor 4D9 | 313 | Gavia stellata OR4 | 203 | 312 | 65% |
| XM\_006260759.1 PREDICTED: Alligator mississippiensis olfactory receptor 1019 | 310 | Fulmarus glacialis OR5 | 221 | 307 | 72% |
| XM\_006260759.1 PREDICTED: Alligator mississippiensis olfactory receptor 1019 | 313 | Fulmarus glacialis OR5 | 220 | 305 | 72% |
| XM\_006267538.1 PREDICTED: Alligator mississippiensis olfactory receptor 1019 | 313 | Struthio camelus OR5 | 224 | 310 | 72% |
| XM\_006268320.1 PREDICTED: Alligator mississippiensis olfactory receptor 10A7 | 313 | Tinamus guttatus OR10 | 213 | 303 | 70% |
| XM\_014595168.1 PREDICTED: Alligator mississippiensis olfactory receptor 2A12 | 313 | Nipponia nippon OR2 | 212 | 313 | 68% |
| XM\_006278509.1 PREDICTED: Alligator mississippiensis olfactory receptor 4N5 | 312 | Pygoscelis adeliae OR4 | 207 | 304 | 68% |
| XM\_014594485.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 | 312 | Phaeton lepturus OR4 | 218 | 312 | 70% |
| XM\_006268319.1 PREDICTED: Alligator mississippiensis olfactory receptor 10C1 | 311 | Columba livia OR10 | 219 | 305 | 72% |
| XM\_006265550.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 | 310 | Struthio camelus OR4 | 220 | 308 | 71% |
| XM\_006278498.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 | 310 | Phaeton lepturus OR4 | 227 | 310 | 73% |
| XM\_006278500.2 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 | 310 | Phaeton lepturus OR4 | 231 | 310 | 75% |
| XM\_019486358.1 PREDICTED: Alligator mississippiensis olfactory receptor 12D1 | 308 | Pterocles gutturalis OR12 | 171 | 259 | 66% |
| XM\_019496768.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 | 302 | Podiceps cristatus OR4 | 195 | 300 | 65% |
| XM\_019496752.1 PREDICTED: Alligator mississippiensis olfactory receptor 4S2 | 292 | Struthio camelus OR4 | 186 | 249 | 75% |
| XM\_005311793.2 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 596 | Tinamus guttatus OR51 | 224 | 301 | 74% |
| XM\_008175041.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4D5 | 229 | Pterocles gutturalis OR4 | 142 | 209 | 68% |
| XM\_008176388.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 | 226 | Columba livia OR14 | 125 | 192 | 65% |
| XM\_008175039.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 | 376 | Nestor notabilis OR6 | 206 | 303 | 68% |
| XM\_008175031.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 201 | Picoides pubescens OR10 | 124 | 191 | 65% |
| XM\_005309244.2 PREDICTED: Chrysemys picta bellii olfactory receptor 1468 | 199 | Melopsittacus undulatus OR10 | 129 | 195 | 66% |
| XM\_008174413.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14I1 | 188 | Nipponia nippon OR14 | 96 | 138 | 70% |
| XM\_005289441.2 PREDICTED: Chrysemys picta bellii olfactory receptor 2AT4 | 372 | Nipponia nippon OR2 | 251 | 308 | 81% |
| XM\_008175033.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A4 | 175 | Fulmarus glacialis OR10 | 123 | 174 | 71% |
| XM\_005309234.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 169 | Fulmarus glacialis OR10 | 117 | 169 | 69% |
| XM\_008175027.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5 | 169 | Fulmarus glacialis OR10 | 118 | 169 | 70% |
| XM\_005314359.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52E4 | 108 | Phoenicopterus ruber OR52 | 62 | 94 | 66% |
| XM\_008178121.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1019 | 584 | Gavia stellata OR5 | 230 | 311 | 74% |
| XM\_008174412.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4D2 | 360 | Corvus brachyrhynchos OR5 | 217 | 307 | 71% |
| XM\_008168738.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 | 356 | Columba livia OR14 | 206 | 307 | 67% |
| XM\_005310841.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5V1 | 356 | Egretta garzetta OR13 | 220 | 322 | 68% |
| XM\_005310413.1 PREDICTED: Chrysemys picta bellii olfactory receptor 12D2 | 355 | Cariama cristata OR12 | 223 | 311 | 72% |
| XM\_008168730.1 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 | 355 | Podiceps cristatus OR14 | 195 | 302 | 65% |
| XM\_008178018.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52K1 | 543 | Struthio camelus OR51 | 211 | 280 | 75% |
| XM\_008175965.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1009 | 351 | Fulmarus glacialis OR8 | 177 | 270 | 66% |
| XM\_005311801.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 538 | Tinamus guttatus OR51 | 222 | 301 | 74% |
| XM\_008177963.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1019 | 348 | Balearica regulorum OR5 | 172 | 253 | 68% |
| XM\_005312774.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4N2 | 528 | Cathartes aura OR4 | 230 | 313 | 73% |
| XM\_008175572.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 346 | Tyto alba OR51 | 174 | 253 | 69% |
| XM\_005309056.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 345 | Phoenicopterus ruber OR10 | 158 | 243 | 65% |
| XM\_008177588.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 | 345 | Charadrius vociferus OR52 | 242 | 307 | 79% |
| XM\_008175561.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 517 | Tinamus guttatus OR51 | 218 | 299 | 73% |
| XM\_005313796.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6C75 | 341 | Fulmarus glacialis OR6 | 208 | 311 | 67% |
| XM\_008174336.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 339 | Fulmarus glacialis OR10 | 150 | 226 | 66% |
| XM\_008174338.1 PREDICTED: Chrysemys picta bellii olfactory receptor 12D2 | 338 | Charadrius vociferus OR12 | 218 | 310 | 70% |
| XM\_005310393.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 336 | Phaeton lepturus OR10 | 204 | 310 | 66% |
| XM\_005310272.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 503 | Haliaeetus leucocephalus OR5 | 211 | 320 | 66% |
| XM\_005310292.2 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 | 334 | Tinamus guttatus OR14 | 189 | 292 | 65% |
| XM\_005310408.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 333 | Opisthocomus hoazin OR6 | 239 | 315 | 76% |
| XM\_008171713.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1019 | 333 | Cathartes aura OR5 | 209 | 307 | 68% |
| XM\_005310400.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10C1 | 332 | Cathartes aura OR10 | 210 | 309 | 68% |
| XM\_008177751.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 490 | Charadrius vociferus OR5 | 201 | 310 | 65% |
| XM\_005309045.2 PREDICTED: Chrysemys picta bellii olfactory receptor 12 | 330 | Balearica regulorum OR5 | 222 | 306 | 73% |
| XM\_008175036.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 330 | Fulmarus glacialis OR6 | 229 | 312 | 73% |
| XM\_008176638.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4Q2 | 487 | Nestor notabilis OR4 | 193 | 297 | 65% |
| XM\_005309255.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 | 484 | Cathartes aura OR6 | 203 | 307 | 66% |
| XM\_005310439.2 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 | 483 | Gavia stellata OR14 | 157 | 242 | 65% |
| XM\_008174340.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 326 | Phoenicopterus ruber OR6 | 209 | 309 | 68% |
| XM\_005290034.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 | 325 | Anas platyrhynchos OR52 | 272 | 323 | 84% |
| XM\_005310406.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A7 | 324 | Pelecanus crispus OR10 | 206 | 303 | 68% |
| XM\_005314585.2 PREDICTED: Chrysemys picta bellii olfactory receptor 14A16 | 324 | Columba livia OR14 | 195 | 290 | 67% |
| XM\_005309064.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10AG1 | 323 | Balearica regulorum OR14 | 198 | 305 | 65% |
| XM\_005314320.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 323 | Fulmarus glacialis OR10 | 148 | 227 | 65% |
| XM\_005311899.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 323 | Phoenicopterus ruber OR6 | 207 | 309 | 67% |
| XM\_005290011.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 | 322 | Phaeton lepturus OR52 | 203 | 305 | 67% |
| XM\_005309043.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6P1 | 322 | Opisthocomus hoazin OR6 | 200 | 310 | 65% |
| XM\_005309055.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 322 | Podiceps cristatus OR10 | 164 | 249 | 66% |
| XM\_005310422.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 322 | Aptenodytes forsteri OR10 | 197 | 303 | 65% |
| XM\_008174332.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 322 | Phoenicopterus ruber OR6 | 203 | 312 | 65% |
| XM\_008177992.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A7 | 438 | Phoenicopterus ruber OR6 | 202 | 306 | 66% |
| XM\_005309019.1 PREDICTED: Chrysemys picta bellii olfactory receptor 1020 | 321 | Aptenodytes forsteri OR5 | 224 | 314 | 71% |
| XM\_005313885.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52K2 | 321 | Cathartes aura OR52 | 233 | 316 | 74% |
| XM\_005310280.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 | 320 | Mesitornis unicolor OR6 | 229 | 304 | 75% |
| XM\_008174321.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 320 | Phoenicopterus ruber OR10 | 160 | 246 | 65% |
| XM\_005309024.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10C1 | 319 | Gavia stellata OR10 | 242 | 310 | 78% |
| XM\_005311817.2 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 319 | Struthio camelus OR51 | 235 | 295 | 80% |
| XM\_005312282.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5V1 | 317 | Charadrius vociferus OR5 | 235 | 316 | 74% |
| XM\_005290052.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 316 | Tinamus guttatus OR51 | 215 | 308 | 70% |
| XM\_005313248.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52R1 | 316 | Gavia stellata OR52 | 224 | 307 | 73% |
| XM\_008178061.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52P1 | 628 | Haliaeetus leucocephalus OR52 | 215 | 316 | 68% |
| XM\_005314254.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 316 | Aptenodytes forsteri OR10 | 206 | 317 | 65% |
| XM\_008174690.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 316 | Cuculus canorus OR5 | 203 | 310 | 65% |
| XM\_005310270.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 418 | Charadrius vociferus OR5 | 200 | 310 | 65% |
| XM\_005309010.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A4 | 315 | Tinamus guttatus OR10 | 195 | 301 | 65% |
| XM\_005313793.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6C4 | 315 | Charadrius vociferus OR6 | 194 | 300 | 65% |
| XM\_005284256.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 417 | Phoenicopterus ruber OR6 | 203 | 306 | 66% |
| XM\_008177186.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 414 | Melopsittacus undulatus OR10 | 206 | 319 | 65% |
| XM\_005290036.2 PREDICTED: Chrysemys picta bellii olfactory receptor 52B2 | 313 | Struthio camelus OR52 | 222 | 310 | 72% |
| XM\_008177901.1 PREDICTED: Chrysemys picta bellii olfactory receptor 51E2 | 313 | Phaeton lepturus OR51 | 230 | 300 | 77% |
| XM\_005309014.1 PREDICTED: Chrysemys picta bellii olfactory receptor 10A4 | 312 | Chaetura pelagica OR10 | 214 | 309 | 69% |
| XM\_005310433.1 PREDICTED: Chrysemys picta bellii olfactory receptor 5V1 | 312 | Phoenicopterus ruber OR13 | 209 | 308 | 68% |
| XM\_005312401.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6F1 | 309 | Tinamus guttatus OR6 | 195 | 302 | 65% |
| XM\_008174396.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4M1 | 309 | Pelecanus crispus OR4 | 199 | 308 | 65% |
| XM\_005311794.2 PREDICTED: Chrysemys picta bellii olfactory receptor 51G2 | 391 | Tinamus guttatus OR51 | 211 | 299 | 71% |
| XM\_005310423.1 PREDICTED: Chrysemys picta bellii olfactory receptor 6N1 | 305 | Fulmarus glacialis OR10 | 145 | 203 | 71% |
| XM\_008174324.1 PREDICTED: Chrysemys picta bellii olfactory receptor 476 | 303 | Fulmarus glacialis OR10 | 120 | 184 | 65% |
| XM\_008177669.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52B6 | 303 | Pelecanus crispus OR52 | 195 | 302 | 65% |
| XM\_008174403.1 PREDICTED: Chrysemys picta bellii olfactory receptor 4D9 | 387 | Geospiza fortis OR4 | 203 | 289 | 70% |
| XM\_008177073.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11A1 | 287 | Charadrius vociferus OR5 | 184 | 272 | 68% |
| XM\_005309054.2 PREDICTED: Chrysemys picta bellii olfactory receptor 1038 | 281 | Picoides pubescens OR10 | 160 | 236 | 68% |
| XM\_005309062.1 PREDICTED: Chrysemys picta bellii olfactory receptor 11L1 | 281 | Melopsittacus undulatus OR10 | 170 | 256 | 66% |
| XM\_008177845.1 PREDICTED: Chrysemys picta bellii olfactory receptor 52K1 | 270 | Struthio camelus OR51 | 146 | 211 | 69% |
| XM\_005309038.2 PREDICTED: Chrysemys picta bellii olfactory receptor 6B1 | 379 | Fulmarus glacialis OR10 | 146 | 226 | 65% |
| XM\_005310284.2 PREDICTED: Chrysemys picta bellii olfactory receptor 1038 | 245 | Charadrius vociferus OR5 | 129 | 196 | 66% |
| Pm066 | 349 | Cathartes aura OR4 | 210 | 298 | 70% |
| Pm091 | 343 | Opisthocomus hoazin OR6 | 242 | 310 | 78% |
| Pm010 | 334 | Charadrius vociferus OR4 | 240 | 306 | 78% |
| Pm120 | 333 | Struthio camelus OR51 | 226 | 303 | 75% |
| Pm047 | 331 | Tinamus guttatus OR5 | 212 | 309 | 69% |
| Pm068 | 331 | Podiceps cristatus OR2 | 209 | 318 | 66% |
| Pm020 | 328 | Cuculus canorus OR5 | 201 | 310 | 65% |
| Pm046 | 328 | Fulmarus glacialis OR10 | 227 | 311 | 73% |
| Pm055 | 328 | Struthio camelus OR6 | 213 | 297 | 72% |
| Pm136 | 324 | Antrostomus carolinensis OR9 Pseudogene | 142 | 215 | 66% |
| Pm045 | 322 | Struthio camelus OR5 | 197 | 303 | 65% |
| Pm148 | 322 | Opisthocomus hoazin OR52 | 228 | 301 | 76% |
| Pm070 | 320 | Tinamus guttatus OR52 | 221 | 303 | 73% |
| Pm119 | 318 | Falco peregrinus OR52 | 251 | 314 | 80% |
| Pm014 | 316 | Tinamus guttatus OR5 | 207 | 312 | 66% |
| Pm053 | 316 | Struthio camelus OR5 | 205 | 308 | 67% |
| Pm030 | 314 | Cariama cristata OR12 | 208 | 314 | 66% |
| Pm036 | 314 | Anas platyrhynchos OR4 Pseudogene | 127 | 190 | 67% |
| Pm049 | 314 | Falco peregrinus OR4 | 206 | 309 | 67% |
| Pm088 | 313 | Antrostomus carolinensis OR11 | 207 | 313 | 66% |
| Pm115 | 313 | Cathartes aura OR4 | 199 | 305 | 65% |
| Pm005 | 310 | Pterocles gutturalis OR5 | 219 | 302 | 73% |
| Pm132 | 310 | Gallus gallus OR5 | 215 | 309 | 70% |
| Pm057 | 309 | Balearica regulorum OR5 | 205 | 305 | 67% |
| Pm123 | 308 | Tyto alba OR9 | 215 | 297 | 72% |
| Pm004 | 300 | Phoenicopterus ruber OR5 | 194 | 300 | 65% |
| Pm096 | 296 | Fulmarus glacialis OR6 | 207 | 271 | 76% |
| Pm023 | 385 | Struthio camelus OR4 | 226 | 301 | 75% |
| Pm054 | 280 | Struthio camelus OR6 | 222 | 269 | 83% |
| Pm155\_P | 196 | Gavia stellata OR10 | 93 | 142 | 65% |
| Pm171\_T | 226 | Struthio camelus OR4 | 142 | 212 | 67% |
| Pm207\_T | 209 | Opisthocomus hoazin OR6 | 142 | 195 | 73% |
| Pm213\_T | 207 | Fulmarus glacialis OR6 | 133 | 193 | 69% |
| Pm223\_T | 199 | Fulmarus glacialis OR4 | 136 | 197 | 69% |
| Pm222\_T | 198 | Antrostomus carolinensis OR12 Pseudogene | 128 | 185 | 69% |
| Pm209\_T | 195 | Gallus gallus OR5 | 125 | 189 | 66% |
| Pm248\_T | 194 | Struthio camelus OR2 | 130 | 186 | 70% |
| Pm250\_T | 190 | Anas platyrhynchos OR12 | 129 | 190 | 68% |
| Pm271\_T | 180 | Gavia stellata OR10 | 134 | 180 | 74% |
| Pm275\_T | 179 | Fulmarus glacialis OR10 | 103 | 159 | 65% |
| Pm277\_T | 174 | Cariama cristata OR12 | 106 | 159 | 67% |
| Pm184\_T | 169 | Fulmarus glacialis OR2 | 110 | 169 | 65% |
| Pm195\_T | 155 | Phoenicopterus ruber OR10 | 63 | 97 | 65% |
| Pm188\_T | 148 | Nestor notabilis OR5 | 101 | 145 | 70% |
| Pm243\_T | 144 | Aptenodytes forsteri OR5 | 96 | 142 | 68% |
| Pm219\_T | 141 | Cathartes aura OR10 | 82 | 126 | 65% |
| Pm279\_T | 141 | Opisthocomus hoazin OR9 | 85 | 131 | 65% |
| Pm178\_T | 140 | Nestor notabilis OR5 | 93 | 140 | 66% |
| Pm252\_T | 132 | Antrostomus carolinensis OR12 Pseudogene | 91 | 132 | 69% |
| Pm204\_T | 261 | Nestor notabilis OR6 | 177 | 260 | 68% |
| Ac93 | 331 | Podiceps cristatus OR10 | 225 | 322 | 70% |
| Ac89 | 324 | Struthio camelus OR6 | 235 | 319 | 74% |
| Ac75 | 323 | Pterocles gutturalis OR6 | 205 | 310 | 66% |
| Ac109 | 323 | Tinamus guttatus OR13 | 198 | 303 | 65% |
| Ac110 | 314 | Tinamus guttatus OR5 | 164 | 237 | 69% |
| Ac52 | 314 | Pterocles gutturalis OR4 | 201 | 306 | 66% |
| Ac98 | 314 | Podiceps cristatus OR10 | 163 | 248 | 66% |
| Ac106 | 314 | Struthio camelus OR4 | 224 | 301 | 74% |
| Ac131 | 314 | Cariama cristata OR9 | 124 | 170 | 73% |
| Ac59 | 313 | Struthio camelus OR6 | 201 | 305 | 66% |
| Ac3 | 312 | Tinamus guttatus OR5 | 204 | 306 | 67% |
| Ac91 | 312 | Struthio camelus OR6 | 231 | 304 | 76% |
| Ac125 | 312 | Fulmarus glacialis OR10 | 148 | 226 | 65% |
| Ac112 | 312 | Phaeton lepturus OR5 | 118 | 179 | 66% |
| Ac119 | 312 | Cariama cristata OR12 | 120 | 186 | 65% |
| Ac44 | 311 | Phaeton lepturus OR6 | 215 | 311 | 69% |
| Ac103 | 311 | Balearica regulorum OR6 | 205 | 308 | 67% |
| Ac27 | 310 | Cathartes aura OR4 | 205 | 298 | 69% |
| Ac20 | 309 | Tinamus guttatus OR5 | 198 | 305 | 65% |
| Ac37 | 307 | Phoenicopterus ruber OR13 | 198 | 305 | 65% |
| Ac87 | 307 | Opisthocomus hoazin OR6 | 231 | 305 | 76% |
| Ac81 | 306 | Calypte anna OR10 | 197 | 302 | 65% |
| Alligator\_mississippiensis\_predicted OR4 | 240 | Phoenicopterus ruber OR4 | 102 | 156 | 65% |
| Alligator\_mississippiensis\_predicted OR10 | 225 | Charadrius vociferus OR10 | 174 | 219 | 79% |
| Alligator\_mississippiensis\_predicted OR51|PSEUDOGENE | 212 | Tinamus guttatus OR51 | 76 | 114 | 67% |
| Alligator\_mississippiensis\_predicted OR13|PSEUDOGENE | 201 | Pelecanus crispus OR13 | 130 | 198 | 66% |
| Alligator\_mississippiensis\_predicted OR6|PSEUDOGENE | 197 | Columba livia OR6 | 98 | 131 | 75% |
| Alligator\_mississippiensis\_predicted OR12|PSEUDOGENE | 77 | Podiceps cristatus OR12 | 53 | 76 | 70% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 94 | Haliaeetus leucophalus OR12 | 59 | 91 | 65% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 35 | Podiceps cristatus OR10 | 23 | 34 | 68% |
| Alligator\_mississippiensis\_predicted OR6|PSEUDOGENE | 144 | Cathartes aura OR5 | 71 | 110 | 65% |
| Alligator\_mississippiensis\_predicted OR2|PSEUDOGENE | 109 | Gavia stellata OR10 | 68 | 105 | 65% |
| Alligator\_mississippiensis\_predicted OR2|PSEUDOGENE | 83 | Phoenicopterus ruber OR13 | 56 | 82 | 68% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 122 | Phaeton lepturus OR13 | 79 | 117 | 68% |
| Alligator\_mississippiensis\_predicted OR2|PSEUDOGENE | 28 | Anas platyrhynchos OR12 | 20 | 28 | 71% |
| Alligator\_mississippiensis\_predicted OR11|PSEUDOGENE | 53 | Picoides pubescens OR10 | 35 | 53 | 66% |
| Alligator\_mississippiensis\_predicted OR9|PSEUDOGENE | 103 | Pygoscelis adeliae OR10 | 71 | 102 | 70% |
| Alligator\_mississippiensis\_predicted OR2|PSEUDOGENE | 43 | Struthio camelus OR6 | 20 | 31 | 65% |
| Alligator\_mississippiensis\_predicted OR5|PSEUDOGENE | 50 | Phaeton lepturus OR10 | 29 | 44 | 66% |
| Alligator\_mississippiensis\_predicted OR12|PSEUDOGENE | 97 | Cariama cristata OR12 | 63 | 95 | 66% |
| Alligator\_mississippiensis\_predicted OR5|PSEUDOGENE | 97 | Phoenicopterus ruber OR6 | 61 | 89 | 69% |
| Alligator\_mississippiensis\_predicted OR8|PSEUDOGENE | 52 | Anas platyrhynchos OR5 | 38 | 52 | 73% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 77 | Fulmarus glacialis OR5 | 44 | 66 | 67% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 40 | Aptenodytes forsteri OR5 Pseudogene | 15 | 22 | 68% |
| Alligator\_mississippiensis\_predicted OR13|PSEUDOGENE | 73 | Phoenicopterus ruber OR10 Pseudogene | 32 | 48 | 67% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 71 | Charadrius vociferus OR10 | 29 | 40 | 73% |
| Alligator\_mississippiensis\_predicted OR12|PSEUDOGENE | 70 | Manacus vitellinus OR12 | 43 | 66 | 65% |
| Alligator\_mississippiensis\_predicted OR12|PSEUDOGENE | 53 | Anas platyrhynchos OR12 | 36 | 52 | 69% |
| Alligator\_mississippiensis\_predicted OR2|PSEUDOGENE | 69 | Nipponia nippon OR5 | 42 | 61 | 69% |
| Alligator\_mississippiensis\_predicted OR13|PSEUDOGENE | 65 | Phoenicopterus ruber OR13 | 31 | 47 | 66% |
| Alligator\_mississippiensis\_predicted OR13|PSEUDOGENE | 60 | Gavia stellata OR8 Pseudogene | 42 | 60 | 70% |
| Alligator\_mississippiensis\_predicted OR13|PSEUDOGENE | 35 | Aptenodytes forsteri OR6 Pseudogene | 26 | 35 | 74% |
| Alligator\_mississippiensis\_predicted OR2|PSEUDOGENE | 64 | Antrostomus carolinensis OR2 Pseudogene | 28 | 39 | 72% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 64 | Phoenicopterus ruber OR10 | 29 | 43 | 67% |
| Alligator\_mississippiensis\_predicted OR14|PSEUDOGENE | 63 | Egretta garzetta OR14 | 40 | 59 | 68% |
| Alligator\_mississippiensis\_predicted OR12|PSEUDOGENE | 62 | Struthio camelus OR2 | 41 | 61 | 67% |
| Alligator\_mississippiensis\_predicted OR10 | 361 | Fulmarus glacialis OR10 | 148 | 227 | 65% |
| Alligator\_mississippiensis\_predicted OR13|PSEUDOGENE | 57 | Struthio camelus OR5 | 33 | 50 | 66% |
| Alligator\_mississippiensis\_predicted OR1|PSEUDOGENE | 50 | Haliaeetus albicilla OR12 Pseudogene | 31 | 47 | 66% |
| Alligator\_mississippiensis\_predicted OR1|PSEUDOGENE | 40 | Struthio camelus OR5 | 26 | 40 | 65% |
| Alligator\_mississippiensis\_predicted OR10|PSEUDOGENE | 45 | Gavia stellata OR8 Pseudogene | 26 | 36 | 72% |
| Alligator\_mississippiensis\_predicted OR5|PSEUDOGENE | 37 | Fulmarus glacialis OR8 | 24 | 36 | 67% |
| Alligator\_mississippiensis\_predicted OR14|PSEUDOGENE | 36 | Balearica regulorum OR14 | 23 | 35 | 66% |
| Alligator\_mississippiensis\_predicted OR6|PSEUDOGENE | 28 | Phoenicopterus ruber OR13 | 19 | 28 | 68% |
| Alligator\_mississippiensis\_predicted OR51 | 350 | Struthio camelus OR51 | 245 | 317 | 77% |
| Alligator\_mississippiensis\_predicted OR10 | 344 | Fulmarus glacialis OR10 | 153 | 226 | 68% |
| Alligator\_mississippiensis\_predicted OR10 | 343 | Phoenicopterus ruber OR10 | 209 | 294 | 71% |
| Alligator\_mississippiensis\_predicted OR55 | 332 | Struthio camelus OR55 | 195 | 285 | 68% |
| Alligator\_mississippiensis\_predicted OR52 | 331 | Cathartes aura OR52 | 235 | 310 | 76% |
| Alligator\_mississippiensis\_predicted OR6 | 331 | Podiceps cristatus OR10 | 164 | 250 | 66% |
| Alligator\_mississippiensis\_predicted OR10 | 328 | Aptenodytes forsteri OR5 | 216 | 323 | 67% |
| Alligator\_mississippiensis\_predicted OR6 | 326 | Struthio camelus OR6 | 257 | 313 | 82% |
| Alligator\_mississippiensis\_predicted OR10 | 325 | Phoenicopterus ruber OR10 | 160 | 246 | 65% |
| Alligator\_mississippiensis\_predicted OR10 | 321 | Fulmarus glacialis OR10 | 147 | 226 | 65% |
| Alligator\_mississippiensis\_predicted OR52 | 321 | Merops nubicus OR52 | 210 | 303 | 69% |
| Alligator\_mississippiensis\_predicted OR5 | 321 | Aptenodytes forsteri OR10 | 201 | 310 | 65% |
| Alligator\_mississippiensis\_predicted OR6 | 320 | Opisthocomus hoazin OR6 | 241 | 303 | 80% |
| Alligator\_mississippiensis\_predicted OR10 | 320 | Charadrius vociferus OR10 | 218 | 319 | 68% |
| Alligator\_mississippiensis\_predicted OR5 | 319 | Phoenicopterus ruber OR5 | 221 | 311 | 71% |
| Alligator\_mississippiensis\_predicted OR6 | 319 | Anas platyrhynchos OR6 | 224 | 312 | 72% |
| Alligator\_mississippiensis\_predicted OR10 | 317 | Pelecanus crispus OR10 | 220 | 308 | 71% |
| Alligator\_mississippiensis\_predicted OR10 | 317 | Balearica regulorum OR10 | 219 | 317 | 69% |
| Alligator\_mississippiensis\_predicted OR52 | 317 | Tinamus guttatus OR52 | 231 | 310 | 75% |
| Alligator\_mississippiensis\_predicted OR52 | 317 | Cariama cristata OR52 | 251 | 314 | 80% |
| Alligator\_mississippiensis\_predicted OR10 | 316 | Fulmarus glacialis OR10 | 209 | 300 | 70% |
| Alligator\_mississippiensis\_predicted OR6 | 316 | Columba livia OR6 | 231 | 311 | 74% |
| Alligator\_mississippiensis\_predicted OR6 | 316 | Struthio camelus OR6 | 252 | 310 | 81% |
| Alligator\_mississippiensis\_predicted OR5 | 315 | Charadrius vociferus OR5 | 231 | 313 | 74% |
| Alligator\_mississippiensis\_predicted OR52 | 315 | Struthio camelus OR52 | 225 | 313 | 72% |
| Alligator\_mississippiensis\_predicted OR10 | 315 | Tinamus guttatus OR10 | 204 | 301 | 68% |
| Alligator\_mississippiensis\_predicted OR4 | 315 | Pterocles gutturalis OR4 | 231 | 306 | 75% |
| Alligator\_mississippiensis\_predicted OR6 | 315 | Nipponia nippon OR6 | 200 | 310 | 65% |
| Alligator\_mississippiensis\_predicted OR5 | 314 | Phaeton lepturus OR5 | 205 | 308 | 67% |
| Alligator\_mississippiensis\_predicted OR12 | 314 | Cariama cristata OR12 | 223 | 309 | 72% |
| Alligator\_mississippiensis\_predicted OR5 | 314 | Struthio camelus OR5 | 219 | 308 | 71% |
| Alligator\_mississippiensis\_predicted OR5 | 313 | Fulmarus glacialis OR5 | 226 | 307 | 74% |
| Alligator\_mississippiensis\_predicted OR5 | 313 | Tinamus guttatus OR5 | 244 | 313 | 78% |
| Alligator\_mississippiensis\_predicted OR10 | 313 | Aptenodytes forsteri OR10 | 192 | 284 | 68% |
| Alligator\_mississippiensis\_predicted OR10 | 313 | Tinamus guttatus OR10 | 203 | 275 | 74% |
| Alligator\_mississippiensis\_predicted OR2 | 313 | Nipponia nippon OR2 | 213 | 313 | 68% |
| Alligator\_mississippiensis\_predicted OR5 | 311 | Haliaeetus leucocephalus OR5 | 211 | 306 | 69% |
| Alligator\_mississippiensis\_predicted OR11 | 311 | Struthio camelus OR6 | 218 | 310 | 70% |
| Alligator\_mississippiensis\_predicted OR14 | 310 | Egretta garzetta OR14 | 173 | 268 | 65% |
| Alligator\_mississippiensis\_predicted OR10 | 301 | Anas platyrhynchos OR2 | 207 | 295 | 70% |
| Alligator\_mississippiensis\_predicted OR2 | 301 | Charadrius vociferus OR2 | 213 | 300 | 71% |
| Alligator\_mississippiensis\_predicted OR6 | 298 | Taeniopygia guttata OR2 | 190 | 262 | 73% |
| Alligator\_mississippiensis\_predicted OR10 | 381 | Anas platyrhynchos OR10 | 203 | 286 | 71% |
| Alligator\_mississippiensis\_predicted OR8 | 265 | Phoenicopterus ruber OR13 | 131 | 200 | 66% |
| Alligator\_mississippiensis\_predicted OR4 | 250 | Podiceps cristatus OR4 | 115 | 163 | 71% |

**Supplementary Table S9.** OR genes showing at least 65% shared identity between reptiles and birds were considered present in extinct dinosaur taxa. Shared ORs that have had their odorant ligand de-orphaned in humans and mice, as well as their human odorant ‘descriptions’, are displayed.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Receptor 65% identity between reptiles and birds** | **Ligands** | **Odor** | **PubChem CID** | **Ref** |
| OR51E2 | Propanoic acid | Sharp, rancid | 1032 | [5] |
| OR51L1 | Hexanoic acid | Goat-like,  Barn-yard animal | 8892 |
| Allyl phenylacetate | - |  |  |
| OR51G2 | Vanillic acid | Pleasant, creamy | 8468 | [5] |
| OR51Q1 | Heptanoic acid | Rancid | 8094 |
| OR52B2 | Heptanoic acid | Rancid | 8094 |
| Pentanal | Strong, acrid, pungent | 8063 |
| Pentanoic acid | Very unpleasant | 7991 |
| 3-Methylbutanoic acid | Disagreeable,  rancid-cheese |  |
| OR52E4 | Octanoic acid | Fruity, unpleasant,  irritating | 379 |
| Nonanoic acid | Fatty, coconut | 8158 |
| Decanoic acid | Unpleasant, rancid | 2969 |
| OR52D1 | Octanoic acid,  methyl ester | Powerful, fruity | 8091 |
| Heptanoic acid | Rancid | 8094 | [6] |
| Octanoic acid | Fruity, unpleasant,  irritating | 379 | [5] |
| OR52R1 | Decanoic acid | Unpleasant, rancid | 2969 |
| Nonanoic acid | Fatty, coconut | 8158 |
|  | | | | |
| OR2A5 | Nonanoic acid | Fatty, coconut | 8158 | [5] |
| 1-Octanol | Orange rose | 957 | [5,6] |
| 1-Nonanol | Floral | 8914 | [5] |
| 1-Decanol | Sweet, floral, fruity | 8174 |
| 1-Heptanol | Fragrant | 8129 |
| OR4E2 | (Methylthio)-methanethiol | - | 122370 |
| (Methylthio)-ethanthiol | - | 525462 |
| Bis(Methyl-thiomethyl) disulphide | - | 158825 |
| OR5AR1 (Olfr1019) | Prenyl acetate | Fruity, floral | 14489 |
| R-limonene | Fruity | 440917 |
| OR6A2 | Heptanal | Fatty, pungent, fruity, metallic blood | 8130 | [5,7] |
| OR6N1 | Allyl benzene | - | 9309 | [5] |
| OR6P1 | Eugenol | Spicy, floral | 3314 |
| OR6X1 | (-)-Carvone | - | 16724 |
| OR10A3 | 1-Nonanethiol | Unpleasant | 15077 |
| 1-Octanol | Orange rose | 957 | [5,6] |
| OR11A1 | 2-Ethyl fenchol | Earthy | 106997 | [5] |
| OR11L1 | (+)-Camphor | Fragrant, penetrating | 159055 |
| (-)-Camphor | Fragrant, penetrating | 444294 |
| (-)-Fenchone | Similar to camphor | 82229 |
| OR12D3 | (+)-Carvone | - | 16724 |
| Olfr545 | Nonanedioic acid | - | 2266 |

**References**

1. Wan Q, Pan SK, Hu L, Zhu Y, Xu PW, Xia JQ, Chen H, He GY, He J, Ni XW, *et al*. 2013 Genome analysis and signature discovery for diving and sensory properties of the endangered Chinese alligator. *Cell Res.* **23** (9): 1091–1105.

2. Green RE, Braun EL, Armstrong J, Earl D, Nguyen N, Hickey G, Vandewege MW, St. John JA, Capella-Gutiérrez S, Castoe TA, *et al*. 2014 Three crocodillian genomes reveal ancestral patterns of evolution among archosaurs. *Science* **346** (6215): 1254449.

3. Shaffer HB, Minx P, Warren DE, Shedlock AM, Thomas RC, Valenzuela N, Abramyan J, Amemiya CT, Badenhorst D, Biggar KY, *et al*. 2013 The western painted turtle genome, a model for the evolution of extreme physiologica adaptations in a slowly evolving lineage. *Gen Biol*. **14**: R28.

5. Modena D, Trentini M, Corsini M, Bombaci A, Giorgetti A. 2011 OlfactionDB A database of olfactory receptors and their ligands. *Adv Lif Sci*. **1** (1): 1–5.

6. Dunkel A, Steinhaus M, Kotthoff M, Nowak B, Krautwurst D, Schieberle P, Hofmann T. 2014 Nature’s chemical signatures in human olfaction: a foodborne perspective for future biotechnology. *Angew Chem*. **53** (28): 7124–7143.

7. Moran JK, Dietrich DR, Elbert T, Pause BM, Kubler L, Weierstall R. 2015 The scent of Blood: A driver of Human Behavior? *PLoS ONE* **10** (9): e0137777.