

Supporting Information

Identifying the Zoonotic Origin of SARS-CoV-2 by Modeling the Binding Affinity Between the Spike Receptor-Binding Domain and Host ACE2

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Supporting Tables

Table S1. 30 ACE2 proteins that were excluded from analysis due to inaccurate annotations (shown as ‘X’) in their sequences.

Accession ID	Species	Class	Common name	Length (aa)	Remark*
XP_005231984.2	<i>Falco peregrinus</i>	Aves	Peregrine falcon	824	Low
XP_005426221.1	<i>Geospiza fortis</i>	Aves	Medium ground-finch	809	Low
XP_009478920.1	<i>Pelecanus crispus</i>	Aves	Dalmatian pelican	809	Low
XP_009509070.1	<i>Phalacrocorax carbo</i>	Aves	Great cormorant	812	
XP_009563864.1	<i>Cuculus canorus</i>	Aves	Common cuckoo	808	Low
XP_009638257.1	<i>Egretta garzetta</i>	Aves	Little egret	806	Low
XP_009703695.1	<i>Cariama cristata</i>	Aves	Red-legged seriema	806	Low
XP_009867056.1	<i>Apaloderma vittatum</i>	Aves	Bar-tailed trogon	791	Low
XP_009909849.1	<i>Picoides pubescens</i>	Aves	Downy woodpecker	387	Partial
XP_009954393.1	<i>Leptosomus discolor</i>	Aves	Madagascar cuckoo roller	809	Low
XP_009978415.1	<i>Tauraco erythrolophus</i>	Aves	Red-crested turaco	703	Low/Partial
XP_010012481.1	<i>Nestor notabilis</i>	Aves	Kea	618	Low
XP_010084373.1	<i>Pterocles gutturalis</i>	Aves	Yellow-throated sandgrouse	631	Partial
XP_010169238.1	<i>Antrostomus carolinensis</i>	Aves	Chuck-will’s-widow	807	
XP_010206054.1	<i>Colius striatus</i>	Aves	Speckled mousebird	656	Low
XP_010217584.1	<i>Tinamus guttatus</i>	Aves	White-throated tinamou	805	Low
XP_013039300.1	<i>Anser cygnoides domesticus</i>	Aves	Domestic goose	805	Low
XP_013888928.1	<i>Austrofundulus limnaeus</i>	Actinopterygii		819	
XP_017367865.1	<i>Cebus capucinus imitator</i>	Mammalia	Panamanian white-faced capuchin	805	
XP_020465646.1	<i>Monopterus albus</i>	Actinopterygii	Asian swamp eel	812	
XP_020863153.1	<i>Phascolarctos cinereus</i>	Mammalia	Koala	807	Low
XP_021154486.1	<i>Columba livia</i>	Aves	Rock dove	799	Low
XP_023417808.1	<i>Cavia porcellus</i>	Mammalia	Domestic guinea pig	813	Low
XP_023679669.1	<i>Paramormyrops kingsleyae</i>	Actinopterygii		805	Low
XP_023998967.1	<i>Salvelinus alpinus</i>	Actinopterygii	Arctic char	789	Low/Partial
XP_025976569.1	<i>Dromaius novaehollandiae</i>	Aves	Emu	804	
XP_026530754.1	<i>Notechis scutatus</i>	Reptilia	Mainland tiger snake	828	Low
XP_030271236.1	<i>Sparus aurata</i>	Actinopterygii	Gilthead seabream	816	Low
XP_031814825.1	<i>Sarcophilus harrisii</i>	Mammalia	Tasmanian devil	806	Low
XP_033056809.1	<i>Trachypithecus francoisi</i>	Mammalia	Francoiss langur	805	Low

*: Low, low-quality sequence; Partial, incomplete ACE2 sequence; Low/Partial, both.

Table S2. Six ACE2 proteins with five or more missing interface residues.

Accession ID	Species	Class	Common name	Length (aa)	Binding (EEU)	Remark*
XP_009082150.1	<i>Acanthisitta chloris</i>	Aves	Rifleman	609	-18.02±0.14	Partial
XP_013805736.1	<i>Apteryx mantelli mantelli</i>	Aves	North island brown kiwi	777	-20.07±0.09	
XP_014062928.1	<i>Salmo salar</i>	Actinopterygii	Atlantic salmon	686	-13.70±0.01	
XP_017744069.1	<i>Rhinopithecus bieti</i>	Mammalia	Black snub-nosed monkey	724	-20.36±0.10	
XP_030886750.1	<i>Leptonychotes weddellii</i>	Mammalia	Weddell seal	344	-16.90±0.08	
XP_032835032.1	<i>Petromyzon marinus</i>	Hyperoartia	Sea lamprey	849	-20.19±0.11	

*: partial, incomplete ACE2 sequence.

Table S3. 285 ACE2 proteins used for detailed analysis in this work.

Accession ID	Species	Common name	Class	Length (aa)
AAX63775.1	<i>Paguma larvata</i>	Masked palm civet	Mammalia	805
ABW16956.1	<i>Nyctereutes procyonoides</i>	Raccoon dog	Mammalia	804
AGZ48803.1	<i>Rhinolophus sinicus</i>	Chinese rufous horseshoe bat	Mammalia	805
NP_001012006.1	<i>Rattus norvegicus</i>	Brown rat	Mammalia	805
NP_001116542.1	<i>Sus scrofa</i>	Pig	Mammalia	805
NP_001124604.1	<i>Pongo abelii</i>	Sumatran orangutan	Mammalia	805
NP_001129168.1	<i>Macaca mulatta</i>	Rhesus macaque	Mammalia	805
NP_001158732.1	<i>Canis lupus familiaris</i>	Dog	Mammalia	804
NP_001277036.1	<i>Capra hircus</i>	Goat	Mammalia	804
NP_001297119.1	<i>Mustela putorius furo</i>	Domestic ferret	Mammalia	805
NP_001358344.1	<i>Homo sapiens</i>	Human	Mammalia	805
NP_081562.2	<i>Mus musculus</i>	House mouse	Mammalia	805
XP_001490241.1	<i>Equus caballus</i>	Horse	Mammalia	805
XP_001515597.2	<i>Ornithorhynchus anatinus</i>	Platypus	Mammalia	806
XP_002194303.4	<i>Taeniopygia guttata</i>	Zebra finch	Aves	811
XP_002719891.1	<i>Oryctolagus cuniculus</i>	Rabbit	Mammalia	805
XP_002938293.2	<i>Xenopus tropicalis</i>	Tropical clawed frog	Amphibia	862
XP_003261132.2	<i>Nomascus leucogenys</i>	Northern white-cheeked gibbon	Mammalia	805
XP_003445853.2	<i>Oreochromis niloticus</i>	Nile tilapia	Actinopterygii	821
XP_003503283.1	<i>Cricetulus griseus</i>	Chinese hamster	Mammalia	805
XP_003791912.1	<i>Otomur garnettii</i>	Small-eared galago	Mammalia	805
XP_004269705.1	<i>Orcinus orca</i>	Killer whale	Mammalia	804
XP_004386381.1	<i>Trichechus manatus latirostris</i>	Florida manatee	Mammalia	800
XP_004415448.1	<i>Odobenus rosmarus divergens</i>	Walrus	Mammalia	732
XP_004435206.1	<i>Ceratotherium simum simum</i>	Southern white rhinoceros	Mammalia	805
XP_004449124.1	<i>Dasybus novemcinctus</i>	Nine-banded armadillo	Mammalia	804
XP_004543482.1	<i>Maylandia zebra</i>	Zebra mbuna	Actinopterygii	803
XP_004597549.2	<i>Ochotona princeps</i>	American pika	Mammalia	808
XP_004612266.1	<i>Sorex araneus</i>	Eurasian common shrew	Mammalia	803
XP_004671523.1	<i>Jaculus jaculus</i>	Lesser egyptian jerboa	Mammalia	805
XP_004710002.1	<i>Echinops telfairi</i>	Small madagascar hedgehog	Mammalia	798
XP_004866157.1	<i>Heterocephalus glaber</i>	Naked mole-rat	Mammalia	805
XP_005037422.1	<i>Ficedula albicollis</i>	Collared flycatcher	Aves	810
XP_005074266.1	<i>Mesocricetus auratus</i>	Golden hamster	Mammalia	805
XP_005151516.2	<i>Melopsittacus undulatus</i>	Budgerigar	Aves	809
XP_005169416.1	<i>Danio rerio</i>	Zebrafish	Actinopterygii	818
XP_005228485.1	<i>Bos taurus</i>	Cattle	Mammalia	811
XP_005316051.3	<i>Ictidomys tridecemlineatus</i>	Thirteen-lined ground squirrel	Mammalia	817
XP_005358818.1	<i>Microtus ochrogaster</i>	Prairie vole	Mammalia	804
XP_005443093.2	<i>Falco cherrug</i>	Saker falcon	Aves	813
XP_005491832.2	<i>Zonotrichia albicollis</i>	White-throated sparrow	Aves	811
XP_005516712.1	<i>Pseudopodoces humilis</i>	Tibetan ground jay	Aves	809
XP_005593094.1	<i>Macaca fascicularis</i>	Crab-eating macaque	Mammalia	805
XP_005724169.1	<i>Pundamilia nyererei</i>		Actinopterygii	803
XP_005799835.1	<i>Xiphophorus maculatus</i>	Southern platyfish	Actinopterygii	808
XP_005903173.1	<i>Bos mutus</i>	Wild yak	Mammalia	804
XP_005943362.1	<i>Haplochromis burtoni</i>	Burtons mouthbrooder	Actinopterygii	803
XP_005997915.2	<i>Latimeria chalumnae</i>	Coelacanth	Sarcopterygii	859
XP_006041602.1	<i>Bubalus bubalis</i>	Water buffalo	Mammalia	803
XP_006122891.1	<i>Pelodiscus sinensis</i>	Chinese soft-shelled turtle	Reptilia	808
XP_006164754.1	<i>Tupaia chinensis</i>	Chinese tree shrew	Mammalia	805
XP_006194263.1	<i>Camelus ferus</i>	Wild bactrian camel	Mammalia	805
XP_006212709.1	<i>Vicugna pacos</i>	Alpaca	Mammalia	805
XP_006639185.1	<i>Lepisosteus oculatus</i>	Spotted gar	Actinopterygii	809
XP_006775273.1	<i>Myotis davidii</i>	David's myotis	Mammalia	819
XP_006780474.1	<i>Neolamprologus brichardi</i>	Princess cichlid	Actinopterygii	803
XP_006835673.1	<i>Chrysochloris asiatica</i>	Cape golden mole	Mammalia	799
XP_006892457.1	<i>Elephantulus edwardii</i>	Cape elephant shrew	Mammalia	798

XP_006911709.1	<i>Pteropus alecto</i>	Black flying fox	Mammalia	805
XP_006973269.1	<i>Peromyscus maniculatus bairdii</i>	Deer mouse	Mammalia	805
XP_007070561.1	<i>Chelonia mydas</i>	Green sea turtle	Reptilia	811
XP_007090142.1	<i>Panthera tigris altaica</i>	Amur tiger	Mammalia	797
XP_007431942.2	<i>Python bivittatus</i>	Burmese python	Reptilia	827
XP_007466389.1	<i>Lipotes vexillifer</i>	Yangtze river dolphin	Mammalia	804
XP_007500935.1	<i>Monodelphis domestica</i>	Gray short-tailed opossum	Mammalia	806
XP_007538670.1	<i>Erinaceus europaeus</i>	Western european hedgehog	Mammalia	804
XP_007560208.1	<i>Poecilia formosa</i>	Amazon molly	Actinopterygii	808
XP_007889845.1	<i>Callorhynchus milii</i>	Ghost shark	Chondrichthyes	836
XP_007951028.1	<i>Orycteropus afer</i>	Aardvark	Mammalia	799
XP_007989304.1	<i>Chlorocebus sabaeus</i>	Green monkey	Mammalia	805
XP_008062810.1	<i>Carlito syrichta</i>	Philippine tarsier	Mammalia	805
XP_008105455.1	<i>Anolis carolinensis</i>	Green anole	Reptilia	814
XP_008153150.1	<i>Eptesicus fuscus</i>	Big brown bat	Mammalia	811
XP_008290762.1	<i>Stegastes partitus</i>	Bicolor damselfish	Actinopterygii	807
XP_008402714.1	<i>Poecilia reticulata</i>	Guppy	Actinopterygii	809
XP_008492997.2	<i>Calypte anna</i>	Annas hummingbird	Aves	805
XP_008542995.1	<i>Equus przewalskii</i>	Mongolian wild horse	Mammalia	805
XP_008694637.1	<i>Ursus maritimus</i>	Polar bear	Mammalia	790
XP_008839098.1	<i>Nannospalax galili</i>	Israeli mole rat	Mammalia	804
XP_008937519.1	<i>Merops nubicus</i>	Northern carmine bee-eater	Aves	799
XP_008972428.2	<i>Pan paniscus</i>	Bonobo	Mammalia	805
XP_008987241.1	<i>Callithrix jacchus</i>	Common marmoset	Mammalia	805
XP_009087922.1	<i>Serinus canaria</i>	Island canary	Aves	809
XP_009275140.1	<i>Aptenodytes forsteri</i>	Emperor penguin	Aves	809
XP_009323767.1	<i>Pygoscelis adeliae</i>	Adelie penguin	Aves	798
XP_009474590.1	<i>Nipponia nippon</i>	Crested ibis	Aves	809
XP_009574896.1	<i>Fulmarus glacialis</i>	Northern fulmar	Aves	632
XP_009667495.1	<i>Struthio camelus australis</i>	South african ostrich	Aves	808
XP_009816127.1	<i>Gavia stellata</i>	Red-throated loon	Aves	809
XP_009887331.1	<i>Charadrius vociferus</i>	Killdeer	Aves	809
XP_009925641.1	<i>Haliaeetus albicilla</i>	White-tailed eagle	Aves	629
XP_009938970.1	<i>Opisthocomus hoazin</i>	Hoatzin	Aves	824
XP_009992128.1	<i>Chaetura pelagica</i>	Chimney swift	Aves	806
XP_010120523.1	<i>Chlamydotis macqueenii</i>	Macqueen's bustard	Aves	808
XP_010136813.1	<i>Buceros rhinoceros silvestris</i>	Rhinoceros hornbill	Aves	794
XP_010156467.1	<i>Eurypyga helias</i>	Sunbittern	Aves	809
XP_010178703.1	<i>Mesitornis unicolor</i>	Brown roatelo	Aves	809
XP_010290019.1	<i>Phaethon lepturus</i>	White-tailed tropicbird	Aves	809
XP_010334925.1	<i>Saimiri boliviensis</i>	Black-capped squirrel monkey	Mammalia	805
XP_010364367.2	<i>Rhinopithecus roxellana</i>	Golden snub-nosed monkey	Mammalia	805
XP_010392735.2	<i>Corvus cornix cornix</i>	Hooded crow	Aves	811
XP_010579828.1	<i>Haliaeetus leucocephalus</i>	Bald eagle	Aves	745
XP_010643477.1	<i>Fukomys damarensis</i>	Damaraland mole-rat	Mammalia	805
XP_010730146.1	<i>Larimichthys crocea</i>	Large yellow croaker	Actinopterygii	810
XP_010790455.1	<i>Notothenia coriiceps</i>	Black rockcod	Actinopterygii	806
XP_010833001.1	<i>Bison bison bison</i>	Plains bison	Mammalia	431
XP_010884777.2	<i>Esox lucius</i>	Northern pike	Actinopterygii	812
XP_010966303.1	<i>Camelus bactrianus</i>	Bactrian camel	Mammalia	805
XP_010991717.1	<i>Camelus dromedarius</i>	Arabian camel	Mammalia	805
XP_011361275.1	<i>Pteropus vampyrus</i>	Large flying fox	Mammalia	804
XP_011733505.1	<i>Macaca nemestrina</i>	Pig-tailed macaque	Mammalia	805
XP_011850923.1	<i>Mandrillus leucophaeus</i>	Drill	Mammalia	805
XP_011891198.1	<i>Cercocebus atys</i>	Sooty mangabey	Mammalia	805
XP_011961657.1	<i>Ovis aries</i>	Sheep	Mammalia	804
XP_012290105.1	<i>Aotus nancymaae</i>	Ma's night monkey	Mammalia	805
XP_012494185.1	<i>Propithecus coquereli</i>	Coquerel's sifaka	Mammalia	826
XP_012585871.1	<i>Condylura cristata</i>	Star-nosed mole	Mammalia	800
XP_012887572.1	<i>Dipodomys ordii</i>	Ords kangaroo rat	Mammalia	805

XP_012949915.2	<i>Anas platyrhynchos</i>	Duck	Aves	805
XP_013362428.1	<i>Chinchilla lanigera</i>	Long-tailed chinchilla	Mammalia	805
XP_013926936.1	<i>Thamnophis sirtalis</i>	Common garter snake	Reptilia	461
XP_014399780.1	<i>Myotis brandtii</i>	Brandts bat	Mammalia	819
XP_014713133.1	<i>Equus asinus</i>	Donkey	Mammalia	783
XP_014731370.1	<i>Sturnus vulgaris</i>	Common starling	Aves	810
XP_014815705.1	<i>Calidris pugnax</i>	Ruff	Aves	809
XP_014837025.1	<i>Poecilia mexicana</i>	Cave molly	Actinopterygii	808
XP_014895313.1	<i>Poecilia latipinna</i>	Sailfin molly	Actinopterygii	808
XP_015226730.1	<i>Cyprinodon variegatus</i>	Sheepshead minnow	Actinopterygii	819
XP_015273067.1	<i>Gekko japonicus</i>	Schlegel's japanese gecko	Reptilia	816
XP_015343540.1	<i>Marmota marmota</i>	Alpine marmot	Mammalia	817
XP_015486815.1	<i>Parus major</i>	Great tit	Aves	814
XP_015742063.1	<i>Coturnix japonica</i>	Japanese quail	Aves	807
XP_015808977.1	<i>Nothobranchius furzeri</i>	Turquoise killifish	Actinopterygii	805
XP_015974412.1	<i>Rosettus aegyptiacus</i>	Egyptian rousette	Mammalia	805
XP_016058453.1	<i>Miniapterus natalensis</i>	Natal long-fingered bat	Mammalia	804
XP_016345325.1	<i>Sinocyclocheilus anshuiensis</i>		Actinopterygii	809
XP_016422243.1	<i>Sinocyclocheilus rhinoceros</i>		Actinopterygii	777
XP_016798468.1	<i>Pan troglodytes</i>	Chimpanzee	Mammalia	805
XP_016887914.1	<i>Cynoglossus semilaevis</i>	Tongue sole	Actinopterygii	802
XP_017295385.1	<i>Kryptolebias marmoratus</i>	Mangrove rivulus	Actinopterygii	814
XP_017313836.1	<i>Ictalurus punctatus</i>	Channel catfish	Actinopterygii	805
XP_017505746.1	<i>Manis javanica</i>	Malayan pangolin	Mammalia	805
XP_017550079.1	<i>Pygocentrus nattereri</i>	Red-bellied piranha	Actinopterygii	804
XP_017583883.1	<i>Corvus brachyrhynchos</i>	American crow	Aves	758
XP_017667729.1	<i>Lepidothrix coronata</i>	Blue-crowned manakin	Aves	811
XP_017939494.2	<i>Manacus vitellinus</i>	Golden-collared manakin	Aves	811
XP_018418558.1	<i>Nanorana parkeri</i>	High himalaya frog	Amphibia	773
XP_018539189.1	<i>Lates calcarifer</i>	Barramundi perch	Actinopterygii	807
XP_018584732.1	<i>Scleropages formosus</i>	Asian bonytongue	Actinopterygii	809
XP_018874749.1	<i>Gorilla gorilla</i>	Western gorilla	Mammalia	805
XP_019273508.1	<i>Panthera pardus</i>	Leopard	Mammalia	805
XP_019350687.1	<i>Alligator mississippiensis</i>	American alligator	Reptilia	805
XP_019381060.1	<i>Gavialis gangeticus</i>	Gharial	Reptilia	803
XP_019384826.1	<i>Crocodylus porosus</i>	Saltwater crocodile	Reptilia	803
XP_019467554.1	<i>Meleagris gallopavo</i>	Wild turkey	Aves	861
XP_019522936.1	<i>Hipposideros armiger</i>	Great roundleaf bat	Mammalia	806
XP_019742561.1	<i>Hippocampus comes</i>	Tiger tail seahorse	Actinopterygii	805
XP_019781177.2	<i>Tursiops truncatus</i>	Atlantic bottle-nosed dolphin	Mammalia	804
XP_019811719.1	<i>Bos indicus</i>	Zebu cattle	Mammalia	811
XP_019935235.1	<i>Paralichthys olivaceus</i>	Bastard halibut	Actinopterygii	721
XP_020140826.1	<i>Microcebus murinus</i>	Gray mouse lemur	Mammalia	851
XP_020493627.1	<i>Labrus bergylta</i>	Ballan wrasse	Actinopterygii	806
XP_020642422.1	<i>Pogona vitticeps</i>	Central bearded dragon	Reptilia	821
XP_020768965.1	<i>Odocoileus virginianus texanus</i>	White-tailed deer	Mammalia	679
XP_020781598.1	<i>Boleophthalmus pectinirostris</i>	Great blue-spotted mudskipper	Actinopterygii	807
XP_021009138.1	<i>Mus caroli</i>	Ryukyu mouse	Mammalia	805
XP_021043935.1	<i>Mus pahari</i>	Shrew mouse	Mammalia	805
XP_021178197.1	<i>Fundulus heteroclitus</i>	Mummichog	Actinopterygii	809
XP_021240731.1	<i>Numida meleagris</i>	Helmeted guineafowl	Aves	810
XP_021388026.1	<i>Lonchura striata domestica</i>	Bengalese finch	Aves	809
XP_021433278.1	<i>Oncorhynchus mykiss</i>	Rainbow trout	Actinopterygii	807
XP_021536480.1	<i>Neomonachus schauinslandi</i>	Hawaiian monk seal	Mammalia	805
XP_021788732.1	<i>Papio anubis</i>	Olive baboon	Mammalia	805
XP_022063988.1	<i>Acanthochromis polyacanthus</i>	Spiny chromis	Actinopterygii	817
XP_022374078.1	<i>Enhydra lutris kenyonii</i>	Sea otter	Mammalia	805
XP_022418360.1	<i>Delphinapterus leucas</i>	Beluga whale	Mammalia	804
XP_022523929.1	<i>Astyanax mexicanus</i>	Mexican tetra	Actinopterygii	805
XP_022605054.1	<i>Seriola dumerili</i>	Greater amberjack	Actinopterygii	807

XP_023054821.1	<i>Piliocolobus tephrosceles</i>	Ugandan red colobus	Mammalia	805
XP_023104564.1	<i>Felis catus</i>	Domestic cat	Mammalia	807
XP_023124156.1	<i>Amphiprion ocellaris</i>	Clown anemonefish	Actinopterygii	807
XP_023257445.1	<i>Seriola lalandi dorsalis</i>	California yellowtail	Actinopterygii	807
XP_023410960.1	<i>Loxodonta africana</i>	African savanna elephant	Mammalia	800
XP_023575315.1	<i>Octodon degus</i>	Common degu	Mammalia	831
XP_023609437.1	<i>Myotis lucifugus</i>	Little brown bat	Mammalia	819
XP_023774184.1	<i>Cyanistes caeruleus</i>	Eurasian blue tit	Aves	814
XP_023964517.1	<i>Chrysemys picta</i>	Painted turtle	Reptilia	828
XP_023971279.1	<i>Physeter macrocephalus</i>	Sperm whale	Mammalia	804
XP_024150631.1	<i>Oryzias melastigma</i>	Marine medaka	Actinopterygii	819
XP_024425698.1	<i>Desmodus rotundus</i>	Vampire bat	Mammalia	804
XP_024599894.1	<i>Neophocaena asiaorientalis</i>	Yangtze finless porpoise	Mammalia	804
XP_025066628.1	<i>Alligator sinensis</i>	Chinese alligator	Reptilia	803
XP_025227847.1	<i>Theropithecus gelada</i>	Gelada	Mammalia	805
XP_025292925.1	<i>Canis lupus dingo</i>	Dingo	Mammalia	804
XP_025713397.1	<i>Callorhinus ursinus</i>	Northern fur seal	Mammalia	806
XP_025790417.1	<i>Puma concolor</i>	Puma	Mammalia	805
XP_025842512.1	<i>Vulpes vulpes</i>	Red fox	Mammalia	804
XP_025891105.1	<i>Nothoprocta perdicaria</i>	Chilean tinamou	Aves	807
XP_025942946.1	<i>Apteryx rowi</i>	Okarito brown kiwi	Aves	808
XP_026020155.1	<i>Astatotilapia calliptera</i>	Eastern happy	Actinopterygii	803
XP_026131313.1	<i>Carassius auratus</i>	Goldfish	Actinopterygii	812
XP_026175949.1	<i>Mastacembelus armatus</i>	Zig-zag eel	Actinopterygii	807
XP_026233431.1	<i>Anabas testudineus</i>	Climbing perch	Actinopterygii	806
XP_026252505.1	<i>Urocitellus parryii</i>	Arctic ground squirrel	Mammalia	817
XP_026333865.1	<i>Ursus arctos horribilis</i>	Grizzly bear	Mammalia	805
XP_026570054.1	<i>Pseudonaja textilis</i>	Eastern brown snake	Reptilia	828
XP_026705725.1	<i>Athene cunicularia</i>	Burrowing owl	Aves	834
XP_026803610.1	<i>Pangasianodon hypophthalmus</i>	Striped catfish	Actinopterygii	805
XP_026867211.2	<i>Electrophorus electricus</i>	Electric eel	Actinopterygii	805
XP_026910297.1	<i>Acinonyx jubatus</i>	Cheetah	Mammalia	805
XP_026951598.1	<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin	Mammalia	804
XP_027024524.1	<i>Tachysurus fulvidraco</i>	Yellow catfish	Actinopterygii	806
XP_027389727.1	<i>Bos indicus x Bos taurus</i>	Hybrid cattle	Mammalia	811
XP_027465353.1	<i>Zalophus californianus</i>	California sea lion	Mammalia	806
XP_027494818.1	<i>Corapipo altera</i>	White-ruffed manakin	Aves	811
XP_027544864.1	<i>Neopelma chrysocephalum</i>	Saffron-crested tyrant-manakin	Aves	811
XP_027593974.1	<i>Pipra filicauda</i>	Wire-tailed manakin	Aves	811
XP_027691156.1	<i>Vombatus ursinus</i>	Common wombat	Mammalia	809
XP_027757151.1	<i>Empidonax traillii</i>	Willow flycatcher	Aves	809
XP_027802308.1	<i>Marmota flaviventris</i>	Yellow-bellied marmot	Mammalia	817
XP_027871671.1	<i>Xiphophorus couchianus</i>	Monterrey platyfish	Actinopterygii	808
XP_027970822.1	<i>Eumetopias jubatus</i>	Steller sea lion	Mammalia	806
XP_028020351.1	<i>Balaenoptera acutorostrata scammoni</i>	North pacific minke whale	Mammalia	804
XP_028257887.1	<i>Parambassis ranga</i>	Indian glassy fish	Actinopterygii	808
XP_028297875.1	<i>Gouania willdenowi</i>	Blunt-snouted clingfish	Actinopterygii	809
XP_028378317.1	<i>Phyllostomus discolor</i>	Pale spear-nosed bat	Mammalia	804
XP_028441363.1	<i>Perca flavescens</i>	Yellow perch	Actinopterygii	820
XP_028617961.1	<i>Grammomys surdaster</i>	African woodland thicket rat	Mammalia	805
XP_028655640.1	<i>Erpetoichthys calabaricus</i>	Rope fish	Actinopterygii	799
XP_028743609.1	<i>Peromyscus leucopus</i>	White-footed mouse	Mammalia	805
XP_028837781.1	<i>Denticeps clupeoides</i>	Denticle herring	Actinopterygii	810
XP_028999570.1	<i>Betta splendens</i>	Siamese fighting fish	Actinopterygii	814
XP_029095804.1	<i>Monodon monoceros</i>	Narwhal	Mammalia	804
XP_029140508.1	<i>Protobothrops mucrosquamatus</i>	Protobothrops mucrosquamatus	Reptilia	861
XP_029283581.1	<i>Cottoperca gobio</i>	Frogmouth	Actinopterygii	807
XP_029354066.1	<i>Echeneis naucrates</i>	Live sharksucker	Actinopterygii	814
XP_029459086.1	<i>Rhinatrema bivittatum</i>	Two-lined caecilian	Amphibia	815
XP_029702274.1	<i>Takifugu rubripes</i>	Torafugu	Actinopterygii	806

XP_029786256.1	<i>Suricata suricatta</i>	Meerkat	Mammalia	805
XP_029855025.1	<i>Aquila chrysaetos chrysaetos</i>	Golden eagle	Aves	809
XP_029904152.1	<i>Myripristis murdjan</i>	Pinecone soldierfish	Actinopterygii	806
XP_029949252.1	<i>Salarias fasciatus</i>	Jewelled blenny	Actinopterygii	816
XP_030058174.1	<i>Microcaecilia unicolor</i>	Tiny Cayenne Caecilian	Amphibia	811
XP_030160839.1	<i>Lynx canadensis</i>	Canada lynx	Mammalia	805
XP_030232530.1	<i>Gadus morhua</i>	Atlantic cod	Actinopterygii	818
XP_030332639.1	<i>Strigops habroptila</i>	Kakapo	Aves	811
XP_030407881.1	<i>Gopherus evgoodei</i>	Goodes thornscrub tortoise	Reptilia	808
XP_030582139.1	<i>Archocentrus centrarchus</i>	Flier cichlid	Actinopterygii	803
XP_030627971.1	<i>Chanos chanos</i>	Milkfish	Actinopterygii	804
XP_030703991.1	<i>Globicephala melas</i>	Long-finned pilot whale	Mammalia	804
XP_030811385.1	<i>Camarhynchus parvulus</i>	Small tree finch	Aves	809
XP_031162227.1	<i>Sander lucioperca</i>	Pike-perch	Actinopterygii	808
XP_031226742.1	<i>Mastomys coucha</i>	Southern multimammate mouse	Mammalia	806
XP_031414786.1	<i>Pluessa harengus</i>	Atlantic herring	Actinopterygii	821
XP_031451919.1	<i>Phasianus colchicus</i>	Common pheasant	Aves	808
XP_031584810.1	<i>Oreochromis aureus</i>	Israeli tilapia	Actinopterygii	821
XP_031702716.1	<i>Anarrhichthys ocellatus</i>	Wolf eel	Actinopterygii	815
XP_031956594.1	<i>Corvus moneduloides</i>	New caledonian crow	Aves	811
XP_032058386.1	<i>Aythya fuligula</i>	Tufted duck	Aves	805
XP_032082934.1	<i>Thamnophis elegans</i>	Western terrestrial garter snake	Reptilia	828
XP_032141854.1	<i>Sapajus apella</i>	Tufted capuchin	Mammalia	805
XP_032187677.1	<i>Mustela erminea</i>	Ermine	Mammalia	805
XP_032245506.1	<i>Phoca vitulina</i>	Harbor seal	Mammalia	805
XP_032355526.1	<i>Etheostoma spectabile</i>	Orangethroat darter	Actinopterygii	808
XP_032417398.1	<i>Xiphophorus hellerii</i>	Green swordtail	Actinopterygii	808
XP_032476001.1	<i>Phocoena sinus</i>	Vaquita	Mammalia	804
XP_032536093.1	<i>Chiroxiphia lanceolata</i>	Lance-tailed manakin	Aves	811
XP_032612508.1	<i>Hylobates moloch</i>	Silvery gibbon	Mammalia	805
XP_032631197.1	<i>Chelonoidis abingdonii</i>	Pinta island tortoise	Reptilia	808
XP_032736028.1	<i>Lontra canadensis</i>	Northern american river otter	Mammalia	805
XP_032746145.1	<i>Rattus rattus</i>	Black rat	Mammalia	793
XP_032865981.1	<i>Tyto alba</i>	Western barn owl	Aves	809
XP_032888812.1	<i>Amblyraja radiata</i>	Thorny skate	Chondrichthyes	773
XP_032907631.1	<i>Catharus ustulatus</i>	Swainsons thrush	Aves	872
XP_032963186.1	<i>Rhinolophus ferrumequinum</i>	Greater horseshoe bat	Mammalia	805
XP_033806113.1	<i>Geotrypetes seraphini</i>	Gaboon caecilian	Amphibia	820
XP_034290793.1	<i>Pantherophis guttatus</i>	Corn snake	Reptilia	828
XP_034341939.1	<i>Arvicanthis niloticus</i>	African grass rat	Mammalia	805
XP_034505781.1	<i>Ailuropoda melanoleuca</i>	Giant panda	Mammalia	705
XP_034612285.1	<i>Trachemys scripta elegans</i>	Red-eared slider	Reptilia	828
XP_034852450.1	<i>Mirounga leonina</i>	Southern elephant seal	Mammalia	805
XP_034971718.1	<i>Zootoca vivipara</i>	Viviparous lizard	Reptilia	806
XP_035182951.1	<i>Oxyura jamaicensis</i>	Ruddy duck	Aves	808
XP_035398116.1	<i>Cygnus atratus</i>	Black Swan	Aves	808
XP_416822.2	<i>Gallus gallus</i>	Chicken	Aves	808

Table S4. Binding energy and the three kinds of sequence identity for the 285 selected species.

Species	Order	Common name	Binding (EEU)	Sequence Identity (%)		
				All	Interface	Key
<i>Pongo abelii</i>	Primates	Sumatran orangutan	-56.21±0.21	98.1	100	100
<i>Pan paniscus</i>	Primates	Bonobo	-55.99±0.12	99.0	100	100
<i>Nomascus leucogenys</i>	Primates	Northern white-cheeked gibbon	-55.84±0.02	97.8	100	100
<i>Gorilla gorilla</i>	Primates	Western gorilla	-55.84±0.05	99.0	100	100
<i>Papio anubis</i>	Primates	Olive baboon	-55.77±0.05	95.3	100	100
<i>Hylobates moloch</i>	Primates	Silvery gibbon	-55.73±0.37	98.0	100	100
<i>Chlorocebus sabaeus</i>	Primates	Green monkey	-55.67±0.04	94.8	100	100
<i>Macaca nemestrina</i>	Primates	Pig-tailed macaque	-55.42±0.13	95.3	100	100
<i>Macaca fascicularis</i>	Primates	Crab-eating macaque	-55.38±0.04	95.2	100	100
<i>Theropithecus gelada</i>	Primates	Gelada	-55.29±0.09	95.3	100	100
<i>Macaca mulatta</i>	Primates	Rhesus macaque	-55.24±0.53	94.9	100	100
<i>Cercocebus atys</i>	Primates	Sooty mangabey	-55.19±0.01	95.2	100	100
<i>Homo sapiens</i>	Primates	Human	-55.16±0.10	100	100	100
<i>Rhinopithecus roxellana</i>	Primates	Golden snub-nosed monkey	-55.09±0.50	95.3	100	100
<i>Pan troglodytes</i>	Primates	Chimpanzee	-54.97±0.24	99.0	100	100
<i>Mandrillus leucophaeus</i>	Primates	Drill	-54.94±0.22	94.9	100	100
<i>Ptilocolobus tephrosceles</i>	Primates	Ugandan red colobus	-54.79±0.13	95.0	100	100
<i>Mesocricetus auratus</i>	Rodentia	Golden hamster	-53.84±0.05	84.5	90	80
<i>Cricetulus griseus</i>	Rodentia	Chinese hamster	-53.77±0.03	84.3	90	80
<i>Nannospalax galili</i>	Rodentia	Northern israeli blind subterranean mole rat	-53.69±0.03	82.7	90	80
<i>Eumetopias jubatus</i>	Carnivora	Steller sea lion	-53.47±0.18	83.3	65	60
<i>Propithecus coquereli</i>	Primates	Coquerel's sifaka	-53.35±0.30	83.5	95	80
<i>Callorhinus ursinus</i>	Carnivora	Northern fur seal	-52.98±0.14	83.3	65	60
<i>Equus caballus</i>	Perissodactyla	Horse	-52.95±0.41	86.8	70	60
<i>Equus przewalskii</i>	Perissodactyla	Mongolian wild horse	-52.95±0.34	87.0	70	60
<i>Panthera tigris altaica</i>	Carnivora	Amur tiger	-52.93±0.32	85.7	80	60
<i>Acinonyx jubatus</i>	Carnivora	Cheetah	-52.88±0.92	85.2	75	60
<i>Capra hircus</i>	Artiodactyla	Goat	-52.86±0.06	81.8	85	80
<i>Oryctolagus cuniculus</i>	Lagomorpha	Rabbit	-52.84±0.22	85.2	80	80
<i>Bos mutus</i>	Artiodactyla	Wild yak	-52.83±0.06	81.5	85	80
<i>Puma concolor</i>	Carnivora	Puma	-52.79±0.09	85.6	80	60
<i>Heterocephalus glaber</i>	Rodentia	Naked mole-rat	-52.79±0.04	84.6	85	80
<i>Bison bison bison</i>	Artiodactyla	Plains bison	-52.78±0.08	81.2	85	80
<i>Panthera pardus</i>	Carnivora	Leopard	-52.74±0.06	85.5	80	60
<i>Mustela erminea</i>	Carnivora	Ermine	-52.74±0.39	83.0	65	60
<i>Phoca vitulina</i>	Carnivora	Harbor seal	-52.73±0.42	82.7	65	60
<i>Bos taurus</i>	Artiodactyla	Cattle	-52.71±0.02	78.1	85	80
<i>Bos indicus x Bos taurus</i>	Artiodactyla	Hybrid cattle	-52.71±0.02	78.1	85	80
<i>Lontra canadensis</i>	Carnivora	Northern american river otter	-52.66±1.12	82.7	65	60
<i>Odobenus rosmarus divergens</i>	Carnivora	Walrus	-52.62±0.53	83.1	65	60
<i>Neomonachus schauinslandi</i>	Carnivora	Hawaiian monk seal	-52.56±0.56	82.5	65	60
<i>Mustela putorius furo</i>	Carnivora	Domestic ferret	-52.55±0.63	82.6	65	60
<i>Zalophus californianus</i>	Carnivora	California sea lion	-52.53±0.80	83.1	65	60
<i>Bos indicus</i>	Artiodactyla	Zebu cattle	-52.47±0.13	78.1	85	80
<i>Bubalus bubalis</i>	Artiodactyla	Water buffalo	-52.45±0.05	81.1	85	80
<i>Jaculus jaculus</i>	Rodentia	Lesser egyptian jerboa	-52.44±0.00	84.8	75	80
<i>Peromyscus maniculatus bairdii</i>	Rodentia	Deer mouse	-52.38±0.07	83.6	85	80
<i>Felis catus</i>	Carnivora	Domestic cat	-52.33±0.20	84.6	80	60
<i>Odocoileus virginianus texanus</i>	Artiodactyla	White-tailed deer	-52.24±0.67	79.1	85	80
<i>Fukomys damarensis</i>	Rodentia	Damaraland mole-rat	-52.22±0.02	84.7	85	80
<i>Lynx canadensis</i>	Carnivora	Canada lynx	-52.21±1.16	85.1	80	60
<i>Ailuropoda melanoleuca</i>	Carnivora	Giant panda	-52.21±0.25	83.5	75	80
<i>Peromyscus leucopus</i>	Rodentia	White-footed mouse	-52.15±0.11	83.1	85	80
<i>Ursus arctos horribilis</i>	Carnivora	Grizzly bear	-52.13±0.14	83.7	75	80
<i>Ovis aries</i>	Artiodactyla	Sheep	-52.09±0.59	81.8	85	80
<i>Delphinapterus leucas</i>	Artiodactyla	Beluga whale	-51.98±0.11	81.6	85	80
<i>Monodon monoceros</i>	Artiodactyla	Narwhal	-51.98±0.07	81.7	85	80
<i>Phocoena sinus</i>	Artiodactyla	Vaquita	-51.95±0.05	81.3	85	80
<i>Physeter macrocephalus</i>	Artiodactyla	Sperm whale	-51.94±0.40	82.8	85	80
<i>Ursus maritimus</i>	Carnivora	Polar bear	-51.93±0.15	83.9	75	80
<i>Neophocaena asiaeorientalis asiaeorientalis</i>	Artiodactyla	Yangtze finless porpoise	-51.85±0.21	81.1	85	80
<i>Microtus ochrogaster</i>	Rodentia	Prairie vole	-51.76±0.14	83.8	75	80
<i>Manis javanica</i>	Pholidota	Malayan pangolin	-51.73±0.35	84.8	65	60
<i>Balaenoptera acutorostrata scammoni</i>	Artiodactyla	North pacific minke whale	-51.65±0.19	82.6	80	80
<i>Marmota marmota</i>	Rodentia	Alpine marmot	-51.62±0.35	84.0	85	80
<i>Vulpes vulpes</i>	Carnivora	Red fox	-51.58±0.18	83.7	75	60
<i>Ictidomys tridecemlineatus</i>	Rodentia	Thirteen-lined ground squirrel	-51.54±0.44	84.5	85	80
<i>Marmota flaviventris</i>	Rodentia	Yellow-bellied marmot	-51.50±0.19	83.8	85	80
<i>Canis lupus familiaris</i>	Carnivora	Dog	-51.38±0.03	83.6	75	60
<i>Canis lupus dingo</i>	Carnivora	Dingo	-51.11±0.20	84.1	75	60
<i>Ceratotherium simum simum</i>	Perissodactyla	Southern white rhinoceros	-51.08±0.05	85.8	80	80
<i>Ochotona princeps</i>	Lagomorpha	American pika	-51.01±0.26	80.8	80	80

<i>Rousettus aegyptiacus</i>	Chiroptera	Egyptian rousette	-50.91 ±0.48	78.9	75	80
<i>Sus scrofa</i>	Artiodactyla	Pig	-50.74 ±0.14	81.4	75	80
<i>Urocitellus parryii</i>	Rodentia	Arctic ground squirrel	-50.62 ±0.22	83.8	80	80
<i>Lagenorhynchus obliquidens</i>	Artiodactyla	Pacific white-sided dolphin	-50.37 ±0.07	81.5	75	80
<i>Nyctereutes procyonoides</i>	Carnivora	Raccoon dog	-50.20 ±0.79	84.1	70	40
<i>Equus asinus</i>	Perissodactyla	Donkey	-50.02 ±0.50	86.0	70	60
<i>Rhinolophus sinicus</i>	Chiroptera	Chinese rufous horseshoe bat	-49.91 ±0.15	80.7	70	60
<i>Camelus bactrianus</i>	Artiodactyla	Bactrian camel	-49.88 ±0.91	83.2	75	60
<i>Mirounga leonina</i>	Carnivora	Southern elephant seal	-49.75 ±0.29	82.6	60	60
<i>Camelus dromedarius</i>	Artiodactyla	Arabian camel	-49.74 ±0.22	83.2	75	60
<i>Phyllostomus discolor</i>	Chiroptera	Pale spear-nosed bat	-49.73 ±0.04	79.9	60	40
<i>Camelus ferus</i>	Artiodactyla	Wild bactrian camel	-49.63 ±0.12	83.2	75	60
<i>Orcinus orca</i>	Artiodactyla	Killer whale	-49.47 ±0.03	81.3	75	80
<i>Pteropus vampyrus</i>	Chiroptera	Large flying fox	-49.29 ±0.00	80.7	70	80
<i>Pteropus alecto</i>	Chiroptera	Black flying fox	-49.29 ±0.06	81.5	70	80
<i>Globicephala melas</i>	Artiodactyla	Long-finned pilot whale	-49.19 ±0.10	81.3	75	80
<i>Tursiops truncatus</i>	Artiodactyla	Atlantic bottle-nosed dolphin	-49.05 ±0.11	81.5	75	80
<i>Lipotes vexillifer</i>	Artiodactyla	Yangtze river dolphin	-49.05 ±0.02	81.8	75	80
<i>Dipodomys ordii</i>	Rodentia	Ords kangaroo rat	-49.01 ±0.13	82.2	80	60
<i>Loxodonta africana</i>	Proboscidea	African savanna elephant	-48.80 ±0.19	81.3	75	60
<i>Orycteropus afer</i>	Tubulidentata	Aardvark	-48.79 ±0.10	80.0	60	60
<i>Enhydra lutris kenyoni</i>	Carnivora	Sea otter	-48.53 ±0.31	82.9	65	60
<i>Trichechus manatus latirostris</i>	Sirenia	Florida manatee	-48.13 ±0.16	82.0	75	60
<i>Paguma larvata</i>	Carnivora	Masked palm civet	-47.97 ±0.00	83.5	65	40
<i>Octodon degus</i>	Rodentia	Common degu	-47.70 ±0.13	81.8	75	40
<i>Vicugna pacos</i>	Artiodactyla	Alpaca	-47.11 ±0.07	83.4	75	60
<i>Callithrix jacchus</i>	Primates	Common marmoset	-46.81 ±0.13	91.7	80	80
<i>Saimiri boliviensis</i>	Primates	Black-capped squirrel monkey	-46.71 ±0.07	92.0	80	80
<i>Otolemur garnettii</i>	Primates	Small-eared galago	-46.54 ±0.13	81.9	65	40
<i>Eptesicus fuscus</i>	Chiroptera	Big brown bat	-46.46 ±0.05	80.5	55	60
<i>Myotis brandtii</i>	Chiroptera	Brandts bat	-46.44 ±0.18	79.5	55	40
<i>Aotus nancymaeae</i>	Primates	Ma's night monkey	-46.28 ±0.53	92.2	80	80
<i>Cyanistes caeruleus</i>	Passeriformes	Eurasian blue tit	-46.23 ±0.10	67.1	45	40
<i>Sapajus apella</i>	Primates	Tufted capuchin	-46.13 ±0.28	92.5	80	80
<i>Myotis davidii</i>	Chiroptera	David's myotis	-46.10 ±0.20	79.2	60	40
<i>Chinchilla lanigera</i>	Rodentia	Long-tailed chinchilla	-46.05 ±0.03	84.7	75	40
<i>Carlito syrichta</i>	Primates	Philippine tarsier	-45.68 ±0.00	84.1	70	60
<i>Suricata suricatta</i>	Carnivora	Meerkat	-45.57 ±0.78	82.9	60	40
<i>Condylura cristata</i>	Eulipotyphla	Star-nosed mole	-45.56 ±0.02	77.6	55	40
<i>Microcebus murinus</i>	Primates	Gray mouse lemur	-45.25 ±0.37	77.9	70	60
<i>Myotis lucifugus</i>	Chiroptera	Little brown bat	-45.12 ±0.11	79.4	55	40
<i>Dasylops novemcinctus</i>	Cingulata	Nine-banded armadillo	-45.00 ±0.58	79.2	55	20
<i>Echinops telfairi</i>	Afrosoricida	Small madagascar hedgehog	-44.99 ±0.10	75.3	50	20
<i>Nothoprocta perdicaria</i>	Tinamiformes	Chilean tinamou	-44.98 ±0.01	66.9	50	40
<i>Chrysochloris asiatica</i>	Afrosoricida	Cape golden mole	-44.75 ±0.02	79.0	50	40
<i>Mus pahari</i>	Rodentia	Shrew mouse	-44.74 ±0.05	83.0	65	60
<i>Rhinolophus ferrumequinum</i>	Chiroptera	Greater horseshoe bat	-44.47 ±0.08	81.5	60	40
<i>Mastomys coucha</i>	Rodentia	Southern multimammate mouse	-44.42 ±0.11	81.8	65	60
<i>Monodelphis domestica</i>	Didelphimorphia	Gray short-tailed opossum	-44.04 ±0.23	71.0	55	20
<i>Serinus canaria</i>	Passeriformes	Island canary	-44.01 ±0.01	66.9	55	40
<i>Grammomys surdaster</i>	Rodentia	African woodland thicket rat	-43.96 ±0.01	82.5	70	60
<i>Hipposideros armiger</i>	Chiroptera	Great roundleaf bat	-43.96 ±0.47	80.5	65	80
<i>Sturnus vulgaris</i>	Passeriformes	Common starling	-43.88 ±0.07	66.4	45	40
<i>Tupaia chinensis</i>	Scandentia	Chinese tree shrew	-43.88 ±0.03	80.7	50	60
<i>Calidris pugnax</i>	Charadriiformes	Ruff	-43.85 ±0.03	64.8	40	40
<i>Gekko japonicus</i>	Squamata	Schlegel's japanese gecko	-43.77 ±0.19	63.5	45	20
<i>Chrysemys picta</i>	Testudines	Painted turtle	-43.61 ±0.01	64.7	50	40
<i>Desmodus rotundus</i>	Chiroptera	Vampire bat	-43.60 ±0.85	79.7	55	20
<i>Rattus rattus</i>	Rodentia	Black rat	-43.34 ±0.03	80.7	60	60
<i>Mus caroli</i>	Rodentia	Ryukyu mouse	-43.20 ±0.02	82.2	65	60
<i>Geotrypetes seraphini</i>	Gymnophiona	Gaboon caecilian	-43.20 ±0.05	60.2	60	40
<i>Struthio camelus australis</i>	Struthioniformes	South african ostrich	-43.17 ±0.41	65.2	50	40
<i>Rattus norvegicus</i>	Rodentia	Brown rat	-43.14 ±0.15	82.5	60	60
<i>Falco cherrug</i>	Falconiformes	Saker falcon	-43.02 ±0.19	64.7	40	20
<i>Aquila chrysaetos chrysaetos</i>	Accipitriformes	Golden eagle	-42.97 ±0.65	65.9	45	20
<i>Coturnix japonica</i>	Galliformes	Japanese quail	-42.92 ±0.19	67.0	45	40
<i>Pantherophis guttatus</i>	Squamata	Corn snake	-42.90 ±0.19	58.8	50	60
<i>Danio rerio</i>	Cypriniformes	Zebrafish	-42.82 ±0.10	57.7	55	60
<i>Cygnus atratus</i>	Anseriformes	Black Swan	-42.81 ±0.00	65.6	50	40
<i>Miniopterus natalensis</i>	Chiroptera	Natal long-fingered bat	-42.79 ±0.54	80.8	55	40
<i>Rhinatrema bivittatum</i>	Gymnophiona	Two-lined caecilian	-42.72 ±0.08	61.6	50	40
<i>Aptenodytes forsteri</i>	Sphenisciformes	Emperor penguin	-42.71 ±0.06	66.9	45	20
<i>Mus musculus</i>	Rodentia	House mouse	-42.62 ±0.22	82.1	60	40
<i>Larimichthys crocea</i>	Perciformes	Large yellow croaker	-42.60 ±0.13	58.6	50	40
<i>Anas platyrhynchos</i>	Anseriformes	Duck	-42.54 ±0.82	65.3	50	40

<i>Phasianus colchicus</i>	Galliformes	Common pheasant	-42.44 ±0.03	66.2	50	40
<i>Corvus moneduloides</i>	Passeriformes	New caledonian crow	-42.38 ±0.06	67.1	45	20
<i>Opisthocomus hoazin</i>	Opisthocomiformes	Hoatzin	-42.37 ±0.24	63.0	50	40
<i>Camarhynchus parvulus</i>	Passeriformes	Small tree finch	-42.34 ±0.11	67.2	55	40
<i>Ictalurus punctatus</i>	Siluriformes	Channel catfish	-42.23 ±0.21	57.8	40	20
<i>Chelonia mydas</i>	Testudines	Green sea turtle	-42.23 ±0.05	66.3	50	40
<i>Oxyura jamaicensis</i>	Anseriformes	Ruddy duck	-42.20 ±0.08	65.7	45	20
<i>Aythya fuligula</i>	Anseriformes	Tufted duck	-42.17 ±0.15	65.8	50	40
<i>Fundulus heteroclitus</i>	Cyprinodontiformes	Mummichog	-42.17 ±0.41	58.3	40	0
<i>Elephantulus edwardii</i>	Macroscelidea	Cape elephant shrew	-42.16 ±0.07	78.2	60	40
<i>Ficedula albicollis</i>	Passeriformes	Collared flycatcher	-42.15 ±0.22	66.7	45	40
<i>Pundamilia nyererei</i>	Cichliformes		-42.11 ±0.13	58.3	55	40
<i>Mesitornis unicolor</i>	Gruiformes	Brown roatelo	-42.09 ±0.26	65.4	50	20
<i>Gallus gallus</i>	Galliformes	Chicken	-42.07 ±1.65	66.1	50	40
<i>Lates calcarifer</i>	Perciformes	Barramundi perch	-42.06 ±0.50	59.5	50	20
<i>Chelonoidis abingdonii</i>	Testudines	Pinta island tortoise	-42.06 ±0.10	66.7	45	40
<i>Arvicanthis niloticus</i>	Rodentia	African grass rat	-42.06 ±0.11	81.1	65	60
<i>Thamnophis elegans</i>	Squamata	Western terrestrial garter snake	-42.02 ±0.29	58.6	55	60
<i>Oreochromis niloticus</i>	Cichliformes	Nile tilapia	-41.99 ±0.60	57.1	60	40
<i>Melopsittacus undulatus</i>	Psittaciformes	Budgerigar	-41.98 ±0.70	66.4	50	40
<i>Buceros rhinoceros silvestris</i>	Bucerotiformes	Rhinoceros hornbill	-41.97 ±0.07	65.7	45	40
<i>Meleagris gallopavo</i>	Galliformes	Wild turkey	-41.94 ±0.01	56.3	50	40
<i>Tyto alba</i>	Strigiformes	Western barn owl	-41.93 ±0.21	65.8	50	40
<i>Betta splendens</i>	Anabantiformes	Siamese fighting fish	-41.87 ±0.07	58.1	45	40
<i>Python bivittatus</i>	Squamata	Burmese python	-41.82 ±0.04	60.1	40	40
<i>Ornithorhynchus anatinus</i>	Monotremata	Platypus	-41.82 ±0.03	68.6	50	40
<i>Pangasianodon hypophthalmus</i>	Siluriformes	Striped catfish	-41.81 ±0.83	58.0	40	20
<i>Pseudopodoces humilis</i>	Passeriformes	Tibetan ground jay	-41.78 ±0.04	67.7	40	20
<i>Zootoca vivipara</i>	Squamata	Viviparous lizard	-41.77 ±0.70	65.0	50	40
<i>Chaetura pelagica</i>	Apodiformes	Chimney swift	-41.76 ±0.55	66.1	50	40
<i>Calypte anna</i>	Apodiformes	Annas hummingbird	-41.74 ±0.12	66.2	50	40
<i>Pygocentrus nattereri</i>	Characiformes	Red-bellied piranha	-41.70 ±0.11	58.1	40	20
<i>Poecilia reticulata</i>	Cyprinodontiformes	Guppy	-41.68 ±0.25	58.0	40	20
<i>Nipponia nippon</i>	Pelecaniformes	Crested ibis	-41.66 ±0.17	66.1	45	20
<i>Athene cucularia</i>	Strigiformes	Burrowing owl	-41.64 ±0.09	63.7	50	40
<i>Chlamydotis macqueenii</i>	Gruiformes	Macqueen's bustard	-41.63 ±0.05	65.6	45	20
<i>Microcaecilia unicolor</i>	Gymnophiona		-41.60 ±0.07	61.5	45	40
<i>Pygoscelis adeliae</i>	Sphenisciformes	Adelie penguin	-41.58 ±0.21	66.0	45	20
<i>Notothenia coriiceps</i>	Perciformes	Black rockcod	-41.48 ±0.19	58.3	50	40
<i>Parus major</i>	Passeriformes	Great tit	-41.47 ±0.25	67.1	40	20
<i>Mastacembelus armatus</i>	Synbranchiformes	Zig-zag eel	-41.38 ±0.21	57.9	40	20
<i>Zonotrichia albicollis</i>	Passeriformes	White-throated sparrow	-41.31 ±0.13	66.0	50	40
<i>Fulmarus glacialis</i>	Procellariiformes	Northern fulmar	-41.26 ±0.09	68.2	45	20
<i>Gavia stellata</i>	Gaviiformes	Red-throated loon	-41.20 ±0.03	66.4	45	20
<i>Astatotilapia calliptera</i>	Cichliformes	Eastern happy	-41.19 ±0.14	58.5	55	40
<i>Numida meleagris</i>	Galliformes	Helmeted guineafowl	-41.04 ±0.18	65.3	45	40
<i>Taeniopygia guttata</i>	Passeriformes	Zebra finch	-40.97 ±0.01	66.2	45	20
<i>Sorex araneus</i>	Eulipotyphla	Eurasian common shrew	-40.97 ±0.00	73.8	45	40
<i>Sinocyclocheilus rhinoceros</i>	Cypriniformes		-40.96 ±0.32	57.7	50	40
<i>Poecilia mexicana</i>	Cyprinodontiformes	Cave molly	-40.85 ±0.29	57.9	40	20
<i>Pseudonaja textilis</i>	Squamata	Eastern brown snake	-40.81 ±0.34	58.2	40	40
<i>Salarias fasciatus</i>	Blenniiformes	Jewelled blenny	-40.72 ±0.22	58.3	45	20
<i>Pelodiscus sinensis</i>	Testudines	Chinese soft-shelled turtle	-40.68 ±0.17	67.0	50	40
<i>Perca flavescens</i>	Perciformes	Yellow perch	-40.53 ±0.11	58.4	45	40
<i>Merops nubicus</i>	Coraciiformes	Northern carmine bee-eater	-40.52 ±0.18	66.3	45	20
<i>Seriola dumerili</i>	Carangiformes	Greater amberjack	-40.45 ±0.35	58.5	35	20
<i>Thamnophis sirtalis</i>	Squamata	Common garter snake	-40.43 ±0.09	57.3	55	60
<i>Phaethon lepturus</i>	Phaethontiformes	White-tailed tropicbird	-40.37 ±0.86	65.4	50	40
<i>Parambassis ranga</i>	Ovalentaria incertae sedis	Indian glassy fish	-40.36 ±0.77	57.8	40	20
<i>Neolamprologus brichardi</i>	Cichliformes	Princess cichlid	-40.35 ±0.30	58.2	55	40
<i>Vombatus ursinus</i>	Diprotodontia	Common wombat	-40.33 ±0.16	71.9	55	40
<i>Trachemys scripta elegans</i>	Testudines	Red-eared slider	-40.31 ±0.18	65.1	50	40
<i>Apteryx rowi</i>	Apterygiformes	Okarito brown kiwi	-40.29 ±0.00	66.2	45	40
<i>Poecilia formosa</i>	Cyprinodontiformes	Amazon molly	-40.29 ±0.10	57.8	40	20
<i>Poecilia latipinna</i>	Cyprinodontiformes	Sailfin molly	-40.29 ±0.06	57.7	40	20
<i>Carassius auratus</i>	Cypriniformes	Goldfish	-40.28 ±0.00	57.9	50	40
<i>Stegastes partitus</i>	Ovalentaria incertae sedis	Bicolor damselfish	-40.24 ±0.18	58.5	45	20
<i>Denticaps clupeioides</i>	Clupeiformes	Denticole herring	-40.20 ±0.69	59.8	45	40
<i>Gopherus evgoodei</i>	Testudines	Goodes thornscrub tortoise	-40.20 ±0.38	66.2	45	40
<i>Protobothrops mucrosquamatus</i>	Squamata	Protobothrops mucrosquamatus	-40.18 ±0.25	55.2	50	60
<i>Seriola lalandi dorsalis</i>	Carangiformes		-40.13 ±0.03	58.5	35	20
<i>Xenopus tropicalis</i>	Anura	Tropical clawed frog	-39.96 ±0.08	55.8	45	20
<i>Charadrius vociferus</i>	Charadriiformes	Killdeer	-39.90 ±0.04	66.6	50	20
<i>Anolis carolinensis</i>	Squamata	Green anole	-39.89 ±0.82	63.0	40	20
<i>Lonchura striata domestica</i>	Passeriformes	Bengalese finch	-39.84 ±0.14	65.6	45	20

<i>Corapipo altera</i>	Passeriformes	White-ruffed manakin	-39.83±0.08	65.2	40	0
<i>Esox lucius</i>	Esociformes	Northern pike	-39.71±0.32	56.1	40	40
<i>Maylandia zebra</i>	Cichliformes	Zebra mbuna	-39.66±0.30	58.5	55	40
<i>Neopelma chrysocephalum</i>	Passeriformes	Saffron-crested tyrant-manakin	-39.51±0.07	65.5	50	40
<i>Pogona vitticeps</i>	Squamata	Central bearded dragon	-39.51±0.01	63.3	45	20
<i>Catharus ustulatus</i>	Passeriformes	Swainsons thrush	-39.50±0.13	61.9	35	0
<i>Haliaeetus albicilla</i>	Accipitriformes	White-tailed eagle	-39.46±0.04	70.3	45	20
<i>Corvus brachyrhynchus</i>	Passeriformes	American crow	-39.44±0.22	67.8	45	20
<i>Haplochromis burtoni</i>	Cichliformes	Burtons mouthbrooder	-39.43±0.19	58.5	55	40
<i>Manacus vitellinus</i>	Passeriformes	Golden-collared manakin	-39.37±0.26	65.5	40	0
<i>Cynoglossus semilaevis</i>	Pleuronectiformes	Tongue sole	-39.37±0.01	57.9	45	40
<i>Empidonax traillii</i>	Passeriformes	Willow flycatcher	-39.36±0.16	65.9	50	40
<i>Archocentrus centrarchus</i>	Cichliformes	Flier cichlid	-39.35±0.29	58.8	55	40
<i>Amphiprion ocellaris</i>	Ovalentaria incertae sedis	Clown anemonefish	-39.32±0.24	58.0	45	20
<i>Hippocampus comes</i>	Syngnathiformes	Tiger tail seahorse	-39.32±0.02	57.3	45	40
<i>Myripristis murdjan</i>	Holocentriformes	Pinecone soldierfish	-39.17±0.62	58.9	45	20
<i>Corvus cornix cornix</i>	Passeriformes	Hooded crow	-39.16±0.07	66.8	40	0
<i>Amblyraja radiata</i>	Rajiformes	Thorny skate	-38.93±0.52	59.2	35	0
<i>Lepidothrix coronata</i>	Passeriformes	Blue-crowned manakin	-38.83±0.46	65.6	40	0
<i>Alligator mississippiensis</i>	Crocodylia	American alligator	-38.81±0.28	66.7	45	0
<i>Alligator sinensis</i>	Crocodylia	Chinese alligator	-38.79±0.18	66.4	45	0
<i>Nothobranchius furzeri</i>	Cyprinodontiformes	Turquoise killifish	-38.73±0.14	59.5	45	0
<i>Sander lucioperca</i>	Perciformes	Pike-perch	-38.73±0.28	59.3	45	40
<i>Crocodylus porosus</i>	Crocodylia	Saltwater crocodile	-38.71±0.04	66.4	40	0
<i>Erinaceus europaeus</i>	Eulipotyphla	Western european hedgehog	-38.67±0.18	79.1	50	0
<i>Pipra filicauda</i>	Passeriformes	Wire-tailed manakin	-38.54±0.09	65.5	40	0
<i>Sinocyclocheilus anshuiensis</i>	Cypriniformes		-38.49±0.21	57.2	50	40
<i>Gavialis gangeticus</i>	Crocodylia	Gharial	-38.48±0.17	66.5	45	0
<i>Xiphophorus hellerii</i>	Cyprinodontiformes	Green swordtail	-38.46±0.46	58.4	35	0
<i>Strigops habroptila</i>	Psittaciformes	Kakapo	-38.32±0.34	64.6	45	20
<i>Acanthochromis polyacanthus</i>	Ovalentaria incertae sedis	Spiny chromis	-38.30±0.68	55.8	35	0
<i>Nanorana parkeri</i>	Anura	High himalaya frog	-38.23±0.26	61.2	35	0
<i>Erpetoichthys calabaricus</i>	Polypteriformes	Rope fish	-38.22±0.07	61.5	45	20
<i>Oreochromis aureus</i>	Cichliformes	Israeli tilapia	-38.15±0.07	57.1	55	40
<i>Kryptolebias marmoratus</i>	Cyprinodontiformes	Mangrove rivulus	-38.13±0.12	58.6	45	20
<i>Etheostoma spectabile</i>	Perciformes	Orangethroat darter	-37.98±0.24	58.9	40	20
<i>Anarrhichthys ocellatus</i>	Perciformes	Wolf eel	-37.83±0.48	58.8	45	20
<i>Callorhinchus milii</i>	Chimaeriformes	Ghost shark	-37.70±0.45	58.1	35	20
<i>Cyprinodon variegatus</i>	Cyprinodontiformes	Sheepshead minnow	-37.67±0.40	58.0	45	20
<i>Electrophorus electricus</i>	Gymnotiformes	Electric eel	-37.36±0.14	58.5	40	20
<i>Chanos chanos</i>	Gonorynchiformes	Milkfish	-37.27±0.30	57.7	40	20
<i>Chiroxiphia lanceolata</i>	Passeriformes	Lance-tailed manakin	-37.18±0.07	65.4	40	0
<i>Anabas testudineus</i>	Anabantiformes	Climbing perch	-36.81±0.39	59.4	40	20
<i>Scleropages formosus</i>	Osteoglossiformes	Asian bonytongue	-36.79±0.02	59.1	35	0
<i>Latimeria chalumnae</i>	Coelacanthiformes	Coelacanth	-36.68±0.22	58.0	40	0
<i>Oncorhynchus mykiss</i>	Salmoniformes	Rainbow trout	-36.65±0.22	58.2	35	0
<i>Oryzias melastigma</i>	Beloniformes	Marine medaka	-36.57±0.34	56.9	45	0
<i>Eurypyga helias</i>	Gruiformes	Sunbittern	-36.54±0.66	65.1	35	0
<i>Boleophthalmus pectinirostris</i>	Gobiiformes	Great blue-spotted mudskipper	-36.34±0.14	56.6	30	20
<i>Gouania willdenowi</i>	Gobiesociformes	Blunt-snouted clingfish	-36.31±0.05	57.6	35	0
<i>Haliaeetus leucocephalus</i>	Accipitriformes	Bald eagle	-36.19±0.07	68.6	40	20
<i>Tachysurus fulvidraco</i>	Siluriformes	Yellow catfish	-36.07±0.56	57.4	40	20
<i>Labrus bergylta</i>	Labriformes	Ballan wrasse	-35.94±0.51	57.6	40	20
<i>Cottoperca gobio</i>	Perciformes	Frogmouth	-35.92±0.77	57.1	45	20
<i>Takifugu rubripes</i>	Tetraodontiformes	Torafugu	-35.88±0.30	56.8	35	0
<i>Xiphophorus couchianus</i>	Cyprinodontiformes	Monterrey platyfish	-35.79±0.04	58.5	35	0
<i>Astyanax mexicanus</i>	Characiformes	Mexican tetra	-35.53±0.71	60.9	40	20
<i>Lepisosteus oculatus</i>	Lepisosteiformes	Spotted gar	-35.26±0.10	59.5	35	0
<i>Echeneis naucrates</i>	Carangiformes	Live sharksucker	-34.66±0.10	57.7	40	20
<i>Paralichthys olivaceus</i>	Pleuronectiformes	Bastard halibut	-34.59±0.68	57.1	40	20
<i>Xiphophorus maculatus</i>	Cyprinodontiformes	Southern platyfish	-34.09±0.47	58.2	35	0
<i>Clupea harengus</i>	Clupeiformes	Atlantic herring	-33.62±0.45	56.0	30	0
<i>Gadus morhua</i>	Gadiformes	Atlantic cod	-33.30±0.26	57.3	45	40

Table S5. Comparison of experimental and predicted N-glycosylation sites on hACE2.

Position	Experimental	NGlycPred	N-GlyDE	NetNGlyc
53	Yes	No	Yes	Yes
90	Yes	Yes	Yes	Yes
103	Yes	Yes	Yes	Yes
322	Yes	Yes	Yes	Yes
432	Yes	No	Yes	Yes
546	Yes	Yes	No	No
690	Yes	Yes	Yes	Yes

Table S6. Potential N-glycosylation sites in the 285 selected ACE2 proteins. Each site is shown in the format of digits-NX(S/T), where the number is the position of the glycosylated asparagine (indexed from 1), and X can be any canonical amino-acid type except proline. Interface glycosylation sites are highlighted in bold.

Accession ID	Class	N-glycosylation sites [denoted as index-NX(S/T)]
AAX63775.1	Mammalia	53-NIT, 216-NYS, 322-NMT, 432-NET, 546-NST, 580-NVT, 660-NQT, 690-NVS
ABW16956.1	Mammalia	52-NIT, 215-NYS, 298-NQS, 321-NMT, 545-NSS, 659-NQT, 689-NVS
AGZ48803.1	Mammalia	82-NYS, 90-NVT, 322-NMT, 329-NNS, 432-NET, 546-NST, 690-NLS
NP_001012006.1	Mammalia	53-NIT, 82-NFS, 90-NAT, 299-NQS, 432-NET, 546-NST, 601-NST, 660-NQT, 690-NVS, 772-NET
NP_001116542.1	Mammalia	53-NIT, 299-NQS, 322-NMT, 329-NNS, 546-NST, 601-NSS, 660-NET, 690-NMS
NP_001124604.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
NP_001129168.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
NP_001158732.1	Mammalia	52-NIT, 215-NYS, 298-NQS, 321-NMT, 545-NSS, 659-NQT, 681-NFS, 689-NVS
NP_001277036.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 322-NMT, 329-NNS, 431-NET, 545-NST, 659-NET, 689-NVS, 790-NNS
NP_001297119.1	Mammalia	53-NIT, 299-NQS, 322-NMT, 546-NSS, 660-NQT, 690-NMS
NP_001358344.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
NP_081562.2	Mammalia	53-NIT, 536-NGS, 546-NST, 660-NQT, 690-NVS, 772-NET
XP_001490241.1	Mammalia	53-NIT, 90-NLT, 322-NMT, 546-NST, 609-NWS, 660-NQT, 690-NAS
XP_001515597.2	Mammalia	52-NIS, 78-NAS, 83-NLS, 321-NMT, 328-NNS, 678-NET, 790-NGS
XP_002194303.4	Aves	39-NIS , 54-NIT, 80-NAS, 324-NMT, 536-NHT, 548-NST, 600-NNS, 692-NIS
XP_002719891.1	Mammalia	53-NIT, 90-NLT, 134-NQS, 432-NET, 546-NST, 636-NDS, 660-NQT, 791-NNS
XP_002938293.2	Amphibia	54-NIT, 76-NAS, 331-NNS, 859-NTT
XP_003261132.2	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
XP_003445853.2	Actinopterygii	390-NLS, 470-NIT, 681-NKT, 710-NAT
XP_003503283.1	Mammalia	53-NIT, 82-NYS, 432-NET, 546-NST, 658-NKT, 690-NVS
XP_003791912.1	Mammalia	53-NIT, 90-NRT, 218-NRS, 432-NET, 609-NWS, 690-NVS
XP_004269705.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 614-NQS, 659-NKT, 689-NMS
XP_004386381.1	Mammalia	53-NIT, 154-NST, 252-NQT, 298-NAT, 541-NST, 575-NVT, 596-NSS, 655-NQT, 685-NVS
XP_004415448.1	Mammalia	53-NIT, 216-NYS, 322-NMT, 432-NET, 616-NTS, 711-NLS
XP_004435206.1	Mammalia	53-NIT, 90-NVT, 216-NYS, 299-NQT, 322-NMT, 546-NST, 580-NVT, 660-NQT, 690-NVS
XP_004449124.1	Mammalia	52-NIT, 81-NFS, 89-NLT, 217-NRS, 321-NMT, 328-NNS, 545-NST, 600-NSS, 608-NWS, 659-NET
XP_004543482.1	Actinopterygii	54-NIT, 390-NLS, 470-NIT, 662-NKT
XP_004597549.2	Mammalia	3-NMS, 56-NIT, 93-NLT, 435-NET, 549-NST, 639-NDS, 693-NVS
XP_004612266.1	Mammalia	23-NAT , 41-NSS , 52-NIT, 121-NMS, 135-NNT, 320-NMT, 532-NHS, 599-NSS, 634-NDS, 658-NET, 688-NAS
XP_004671523.1	Mammalia	53-NIT, 432-NET, 546-NST, 690-NVS, 772-NQT
XP_004710002.1	Mammalia	38-NVS , 53-NIT, 489-NES, 541-NST, 655-NQT
XP_004866157.1	Mammalia	53-NIT, 90-NLT, 546-NST, 690-NIT, 772-NRT
XP_005037422.1	Aves	21-NVT , 54-NIT, 80-NAS, 324-NMT, 331-NNS, 536-NHT, 548-NST, 582-NAT, 600-NNS, 638-NDS, 692-NVT
XP_005074266.1	Mammalia	53-NIT, 82-NYS, 90-NLT, 432-NET, 546-NST, 658-NKT, 690-NVS, 772-NET
XP_005151516.2	Aves	52-NIT, 78-NAS, 153-NST, 329-NNS, 534-NHT, 580-NAS, 690-NIS
XP_005169416.1	Actinopterygii	328-NNS, 545-NST, 677-NFT, 687-NET
XP_005228485.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 431-NET, 545-NST, 659-NET, 689-NVS
XP_005316051.3	Mammalia	63-NIT, 100-NFT, 164-NST, 332-NMT, 556-NST, 619-NWS, 670-NQT, 700-NVS, 782-NQT
XP_005358818.1	Mammalia	53-NIT, 546-NST, 659-NQT, 689-NVS, 771-NET
XP_005443093.2	Aves	41-NIS , 56-NIT, 82-NAS, 333-NNS, 538-NHT, 550-NSS, 576-NVT, 602-NNS, 694-NIS
XP_005491832.2	Aves	54-NIT, 80-NAS, 331-NNS, 548-NST, 574-NIT, 600-NNS, 692-NIS
XP_005516712.1	Aves	19-NVT , 37-NIS , 52-NIT, 78-NAS, 546-NST, 598-NNS
XP_005593094.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
XP_005724169.1	Actinopterygii	54-NIT, 390-NLS, 470-NIT, 662-NKT
XP_005799835.1	Actinopterygii	37-NAS , 391-NLS, 471-NIS
XP_005903173.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 431-NET, 545-NST, 659-NET, 689-NVS, 790-NNS
XP_005943362.1	Actinopterygii	54-NIT, 390-NLS, 470-NIT, 662-NKT
XP_00599715.2	Sarcopterygii	97-NIT, 123-NAS, 375-NYS, 580-NHT, 592-NST, 618-NVT, 739-NIS, 742-NSS
XP_006041602.1	Mammalia	52-NIT, 89-NLT, 297-NQS, 430-NET, 544-NST, 658-NET, 688-NVS, 789-NNS
XP_006122891.1	Reptilia	52-NIT, 78-NAS, 89-NHT, 303-NAT, 387-NLS, 432-NET, 580-NAT, 598-NNS, 660-NQT, 690-NAT
XP_006164754.1	Mammalia	53-NIT, 78-NQS, 218-NRT, 322-NMT, 546-NST, 690-NVS
XP_006194263.1	Mammalia	53-NIT, 90-NVT, 299-NQS, 322-NMT, 546-NST, 660-NQT, 690-NVS, 791-NNS
XP_006212709.1	Mammalia	53-NIT, 90-NVT, 299-NQS, 322-NMT, 546-NST, 690-NVS, 791-NNS
XP_006639185.1	Actinopterygii	34-NAT , 52-NIT, 328-NES, 387-NLS, 432-NET, 546-NST, 691-NNS, 692-NST, 790-NQT, 805-NHT
XP_006775273.1	Mammalia	53-NIT, 103-NGS, 431-NET, 493-NET, 674-NQT, 704-NVS, 799-NLS
XP_006780474.1	Actinopterygii	54-NIT, 390-NLS, 470-NIT, 662-NKT
XP_006835673.1	Mammalia	52-NIT, 89-NST, 153-NST, 316-NMT, 540-NST, 654-NQT, 684-NQS
XP_006892457.1	Mammalia	53-NIT, 154-NST, 298-NAT, 317-NMT, 427-NET, 541-NST, 575-NVT, 610-NQS, 654-NQT, 683-NGS
XP_006911709.1	Mammalia	53-NIT, 213-NGS, 322-NMT, 432-NET, 546-NST, 660-NLT, 690-NVS
XP_006973269.1	Mammalia	53-NIT, 82-NYS, 546-NST, 658-NKT, 690-NVS, 772-NET
XP_007070561.1	Reptilia	52-NIT, 78-NAS, 329-NNS, 387-NLS, 435-NET, 537-NHT, 549-NST, 583-NAT, 601-NNS, 663-NQT, 677-NVT, 693-NTT
XP_007090142.1	Mammalia	45-NIT, 82-NTT, 208-NYS, 291-NQS, 314-NMT, 538-NSS, 572-NVT, 652-NQT, 682-NVS
XP_007431942.2	Reptilia	77-NIT, 103-NAS, 344-NMT, 620-NNS, 631-NWT, 682-NQT, 712-NVS
XP_007466389.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 659-NET, 689-NVS, 790-NNS
XP_007500935.1	Mammalia	53-NIT, 75-NQS, 90-NAT, 301-NWS, 322-NMT, 432-NET, 546-NST, 689-NGT
XP_007538670.1	Mammalia	38-NVS , 53-NIT, 103-NGS, 154-NST, 216-NYS, 329-NNS, 432-NET, 580-NVT, 660-NQT, 674-NLT
XP_007560208.1	Actinopterygii	37-NAS , 391-NLS, 471-NIS
XP_007889845.1	Chondrichthyes	53-NIT, 548-NST, 702-NST, 719-NTT, 832-NTT
XP_007951028.1	Mammalia	38-NLS , 53-NIT, 90-NST, 153-NST, 297-NAT, 488-NES, 540-NST, 601-NTS, 684-NES
XP_007989304.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS

XP_008062810.1 Mammalia 53-NIT, 90-NST, 103-NGS, 218-NST, 322-NMT, 432-NET
 XP_008105455.1 Reptilia **46-NRS**, 61-NIT, 98-NDT, 555-NST, 589-NAS, 607-NNT, 683-NVT, 698-NDS, 809-NNS, 810-NST
 XP_008153150.1 Mammalia **24-NAT**, 53-NIT, 90-NLT, 103-NGS, 215-NYS, 279-NLT, 328-NNS, 431-NET, 545-NST, 666-NQT, 696-NMS, 791-NLS
 XP_008290762.1 Actinopterygii 54-NIT, 390-NLS, 470-NIS, 549-NST, 664-NQT
 XP_008402714.1 Actinopterygii **37-NAS**, 391-NLS, 471-NIS
 XP_008492997.2 Aves 52-NIT, 78-NAS, 329-NNS, 534-NHT, 546-NST, 598-NNS, 690-NIS
 XP_008542995.1 Mammalia 53-NIT, 90-NLT, 322-NMT, 546-NST, 609-NWS, 660-NQT, 690-NAS
 XP_008694637.1 Mammalia 38-NIT, 75-NST, 201-NYS, 307-NMT, 417-NET, 531-NSS, 675-NVS
 XP_008839098.1 Mammalia 52-NIT, 431-NET, 545-NST, 689-NVS, 771-NQT
 XP_008937519.1 Aves 52-NIT, 82-NAT, 146-NST, 524-NHT, 588-NNS, 682-NDT
 XP_008972428.2 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_008987241.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 609-NWS, 690-NVS
 XP_009087922.1 Aves 52-NIT, 78-NAS, 322-NMT, 329-NNS, 534-NHT, 546-NST, 580-NAS, 598-NNS, 690-NIS
 XP_009275140.1 Aves **37-NIS**, 52-NIT, 78-NAS, 257-NST, 329-NNS, 534-NHT, 572-NVT, 598-NNS, 636-NES, 690-NIS
 XP_009323767.1 Aves **37-NIS**, 52-NIT, 78-NAS, 257-NST, 329-NNS, 523-NHT, 569-NAT, 587-NNS, 679-NIS
 XP_009474590.1 Aves **37-NIS**, 52-NIT, 78-NAS, 153-NST, 329-NNS, 534-NHT, 546-NST, 598-NNS
 XP_009574896.1 Aves 52-NIT, 78-NAS, 153-NST, 329-NNS, 534-NHT, 546-NST, 598-NNS
 XP_009667495.1 Aves 52-NIT, 78-NAS, 322-NMT, 329-NNS, 467-NIT, 546-NST, 580-NAT, 598-NNS, 690-NIS, 782-NFS
 XP_009816127.1 Aves **37-NIS**, 52-NIT, 78-NAS, 153-NST, 329-NNS, 534-NHT, 572-NVT, 598-NNS, 690-NIS, 775-NRS
 XP_009887331.1 Aves **37-NIS**, 52-NIT, 78-NAS, 280-NLT, 329-NNS, 534-NHT, 546-NST, 598-NNS, 674-NQT, 690-NVS
 XP_009925641.1 Aves **37-NIS**, 52-NIT, 150-NST, 191-NYS, 326-NNS, 543-NSS, 577-NAT, 595-NNS
 XP_009938970.1 Aves 52-NIT, 78-NAS, 153-NST, 194-NYS, 329-NNS, 549-NHT, 561-NST, 613-NNS, 705-NNS
 XP_009992128.1 Aves **19-NVT**, 52-NIT, 78-NAS, 194-NYS, 534-NHT, 598-NNS, 690-NIS
 XP_010120523.1 Aves **37-NIS**, 52-NIT, 78-NAS, 153-NST, 194-NYS, 329-NNS, 533-NHT, 597-NNS, 635-NDS, 689-NIS
 XP_010136813.1 Aves 63-NAS, 307-NMT, 314-NNS, 519-NHT, 557-NVT, 583-NNS, 675-NIS
 XP_010156467.1 Aves **37-NIS**, 52-NIT, 78-NAS, 194-NYS, 534-NHT, 546-NST, 598-NNS
 XP_010178703.1 Aves 52-NIT, 78-NAS, 329-NNS, 546-NST, 580-NAT, 598-NNS, 690-NMS
 XP_010290019.1 Aves 52-NIT, 78-NAS, 153-NST, 329-NNS, 534-NHT, 598-NNS, 690-NVS
 XP_010334925.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 609-NWS, 660-NQT, 690-NVS
 XP_010364367.2 Mammalia 53-NIT, 90-NLT, 103-NGS, 136-NNS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_010392735.2 Aves **39-NIS**, 54-NIT, 80-NAS, 324-NMT, 536-NHT, 548-NST, 600-NNS, 692-NIS
 XP_010579828.1 Aves **12-NIS**, 27-NIT, 53-NAS, 128-NST, 169-NYS, 304-NNS, 521-NSS, 555-NAT, 573-NNS, 665-NIS
 XP_010643477.1 Mammalia 53-NIT, 90-NLT, 432-NET, 546-NST, 660-NKT, 690-NIT, 772-NKT, 791-NNT
 XP_010730146.1 Actinopterygii 54-NIT, 76-NMS, 218-NYT, 331-NNS, 389-NLS, 434-NET, 577-NDT, 605-NRT, 678-NDT
 XP_010790455.1 Actinopterygii 76-NMS, 331-NKS, 390-NLS, 430-NFT, 435-NET, 470-NIT, 664-NQT
 XP_010833001.1 Mammalia 53-NIT, 90-NLT, 298-NQS
 XP_010884777.2 Actinopterygii 69-NIT, 405-NQS, 450-NET, 564-NST, 679-NKT, 682-NVS, 806-NAT
 XP_010966303.1 Mammalia 53-NIT, 90-NVT, 299-NQS, 322-NMT, 546-NST, 660-NQT, 690-NVS, 791-NNS
 XP_010991717.1 Mammalia 53-NIT, 90-NVT, 299-NQS, 322-NMT, 546-NST, 660-NQT, 690-NVS, 791-NNS
 XP_011361275.1 Mammalia 53-NIT, 213-NGS, 321-NMT, 431-NET, 545-NST, 659-NLT, 689-NVS
 XP_011733505.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_011850923.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_011891198.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_011961657.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 431-NET, 545-NST, 659-NET, 689-NVS, 790-NNS
 XP_012290105.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 660-NQT, 690-NVS
 XP_012494185.1 Mammalia 74-NIT, 111-NVT, 239-NRS, 343-NMT, 453-NET, 567-NST, 630-NWS, 681-NQT, 711-NVS
 XP_012585871.1 Mammalia **23-NQT**, **42-NSS**, 53-NIT, 317-NMT, 655-NET
 XP_012887572.1 Mammalia 53-NIT, 432-NET, 660-NQT, 674-NLT, 689-NNS, 690-NSS
 XP_012949915.2 Aves 52-NIT, 78-NAS, 322-NMT, 534-NHT, 546-NST, 580-NAT, 598-NNS, 634-NKS, 687-NAS
 XP_013362428.1 Mammalia 53-NIT, 90-NLT, 299-NQS, 546-NST, 601-NAS, 660-NQT, 690-NIS
 XP_013926936.1 Reptilia 77-NLT, 103-NAS, 114-NET, 130-NSS, 176-NWS, 309-NKT, 351-NNS
 XP_014399780.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 215-NYS, 279-NLT, 328-NNS, 431-NET, 674-NQT, 704-NIS, 799-NLS
 XP_014713133.1 Mammalia 53-NIT, 90-NLT, 300-NMT, 524-NST, 587-NWS, 638-NQT, 668-NAS
 XP_014731370.1 Aves 54-NIT, 80-NAS, 324-NMT, 548-NST, 574-NVT, 600-NNS, 692-NIT
 XP_014815705.1 Aves 52-NIT, 78-NAS, 153-NST, 329-NNS, 546-NST, 580-NAT, 598-NNS, 690-NIS
 XP_014837025.1 Actinopterygii **37-NAS**, 391-NLS, 471-NIS
 XP_014895313.1 Actinopterygii **37-NAS**, 391-NLS, 471-NIS
 XP_015226730.1 Actinopterygii **38-NAT**, 56-NIT, 284-NMS, 333-NNS, 392-NLS, 472-NFS, 800-NRS
 XP_015273067.1 Reptilia **37-NLS**, 52-NIT, 102-NGS, 194-NYS, 303-NVT, 322-NMT, 534-NHT, 546-NST, 572-NVT, 580-NAT, 615-NDT, 660-NET, 690-NDS
 XP_015343540.1 Mammalia 63-NIT, 100-NFT, 164-NST, 332-NMT, 442-NET, 556-NST, 619-NWS, 670-NQT, 700-NVS, 782-NQT
 XP_015486815.1 Aves **24-NVT**, **42-NIS**, 57-NIT, 83-NAS, 140-NNS, 141-NSS, 551-NST, 585-NAT, 603-NNS
 XP_015742063.1 Aves 52-NIT, 78-NAS, 194-NYS, 280-NLT, 322-NMT, 534-NHT, 546-NST, 580-NAT, 598-NNS, 690-NVS
 XP_015808977.1 Actinopterygii **36-NAT**, 158-NYS, 390-NLS, 435-NET, 664-NQT, 678-NET
 XP_015974412.1 Mammalia 136-NNS, 213-NGS, 322-NMT, 432-NET, 546-NST, 660-NLT, 690-NVS
 XP_016058453.1 Mammalia 53-NIT, 68-NWS, 90-NSS, 216-NYS, 280-NVT, 322-NMT, 329-NNS, 546-NST, 659-NQT, 689-NVS, 784-NLS
 XP_016345325.1 Actinopterygii 318-NMS, 545-NST, 681-NET
 XP_016422243.1 Actinopterygii 318-NMS, 545-NST, 681-NET
 XP_016798468.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_016887914.1 Actinopterygii **41-NYS**, 52-NIT, 329-NNS, 388-NLS, 535-NHT, 662-NQT, 676-NET
 XP_017295385.1 Actinopterygii 4-NMS, **41-NAT**, 163-NYS, 336-NNS, 395-NLS, 671-NQT
 XP_017313836.1 Actinopterygii 318-NMS, 546-NST, 692-NAT, 789-NGT
 XP_017505746.1 Mammalia 53-NIT, 90-NDT, 216-NYS, 299-NQT, 432-NET, 636-NDS, 690-NVS
 XP_017550079.1 Actinopterygii 52-NIT, 318-NMS, 328-NNS, 545-NST, 691-NAS
 XP_017583883.1 Aves **39-NIS**, 54-NIT, 271-NMT, 483-NHT, 495-NST, 547-NNS, 639-NIS

XP_017667729.1 Aves **39-NIS**, 54-NIT, 80-NAS, 196-NYS, 324-NMT, 536-NHT, 548-NST, 582-NAT, 600-NNS, 692-NIS
 XP_017939494.2 Aves **39-NIS**, 54-NIT, 80-NAS, 196-NYS, 324-NMT, 536-NHT, 548-NST, 582-NAT, 600-NNS, 692-NIS
 XP_018418558.1 Amphibia 53-NIS, 75-NAS, 136-NGT, 329-NKS, 546-NST, 677-NQT
 XP_018539189.1 Actinopterygii 54-NIT, 158-NYS, 331-NNS, 390-NQS, 435-NET, 606-NRT
 XP_018584732.1 Actinopterygii **37-NAT**, 55-NIT, 216-NYS, 390-NLS, 435-NET, 549-NST, 797-NKS
 XP_018874749.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_019273508.1 Mammalia 53-NIT, 90-NTT, 216-NYS, 299-NQS, 322-NMT, 546-NSS, 580-NVT, 660-NQT, 690-NVS
 XP_019350687.1 Reptilia **19-NVT**, 48-NIT, 74-NAS, 301-NAS, 384-NLT, 543-NST, 577-NAT, 595-NNT, 604-NTT, 687-NTS
 XP_019381060.1 Reptilia **19-NVT**, 48-NIT, 74-NAS, 81-NET, 325-NNS, 382-NLT, 427-NDT, 541-NST, 575-NAT, 655-NET
 XP_019384826.1 Reptilia **19-NVT**, 48-NIT, 74-NAS, 325-NNS, 541-NST, 575-NAT, 593-NNT, 602-NTT, 685-NIS
 XP_019467554.1 Aves 52-NIT, 78-NAS, 194-NYS, 280-NLT, 322-NMT, 546-NST, 721-NGS, 746-NIS, 765-NVT, 782-NTT
 XP_019522936.1 Mammalia 53-NIT, 90-NAT, 322-NMT, 432-NET, 546-NST, 601-NSS, 661-NQT
 XP_019742561.1 Actinopterygii 54-NIT, 158-NYS, 329-NNS, 388-NLS, 428-NFT, 662-NNT
 XP_019781177.2 Mammalia 53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 614-NQS, 659-NKT, 689-NMS
 XP_019811719.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 431-NET, 545-NST, 659-NET, 689-NVS
 XP_019935235.1 Actinopterygii 55-NYS, 66-NIT, 343-NNS, 482-NIS, 618-NRT, 676-NQT, 706-NTS
 XP_020140826.1 Mammalia 79-NIT, 116-NLT, 244-NRS, 348-NMT, 572-NST, 606-NVT, 635-NWS, 736-NVS
 XP_020493627.1 Actinopterygii **43-NYS**, 331-NNS, 389-NLS, 469-NIT, 663-NKT
 XP_020642422.1 Reptilia 51-NLS, 66-NIT, 103-NET, 167-NST, 317-NVT, 343-NNS, 446-NET, 560-NST, 594-NAS, 612-NNT, 672-NKT, 704-NTT, 800-NTS

 XP_020768965.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 431-NET, 545-NST
 XP_020781598.1 Actinopterygii **44-NYS**, 391-NLS, 550-NST, 666-NTT
 XP_021009138.1 Mammalia 53-NIT, 546-NST, 634-NWT, 690-NVS, 772-NET
 XP_021043935.1 Mammalia 53-NIT, 82-NFS, 299-NQS, 546-NST, 660-NQT, 690-NVS, 772-NET
 XP_021178197.1 Actinopterygii **38-NAS**, 307-NET, 392-NLS, 670-NFT
 XP_021240731.1 Aves 54-NIT, 80-NAS, 196-NYS, 282-NLT, 324-NMT, 548-NST, 582-NAT, 600-NNS, 692-NVS
 XP_021388026.1 Aves **37-NIS**, 52-NIT, 78-NAS, 534-NHT, 546-NST, 598-NNS, 690-NIT
 XP_021433278.1 Actinopterygii **37-NAT**, 391-NLS, 550-NST, 665-NKT, 794-NKT
 XP_021536480.1 Mammalia 53-NIT, 75-NQS, 216-NYS, 299-NQS, 322-NMT, 546-NSS, 690-NVS, 785-NLS
 XP_021788732.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_022063988.1 Actinopterygii **36-NAT**, 54-NIT, 289-NQT, 331-NNS, 390-NLS, 430-NFT, 435-NYT, 470-NIT, 537-NHT, 606-NRT, 664-NQS
 XP_022374078.1 Mammalia 53-NIT, 216-NYS, 299-NQS, 322-NMT, 690-NMS
 XP_022418360.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 659-NET, 689-NMS, 790-NNS
 XP_022523929.1 Actinopterygii 52-NIT, 318-NMS, 546-NST
 XP_022605054.1 Actinopterygii 54-NIT, 158-NYS, 331-NDS, 390-NLS, 435-NET, 470-NIS, 664-NES
 XP_023054821.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_023104564.1 Mammalia 53-NIT, 90-NTT, 218-NYS, 301-NQS, 324-NMT, 548-NSS, 582-NVT, 662-NQT, 692-NVS
 XP_023124156.1 Actinopterygii 54-NIT, 390-NLS, 435-NDT, 470-NIT, 664-NQS
 XP_023257445.1 Actinopterygii 54-NIT, 158-NYS, 331-NDS, 390-NLS, 435-NET, 470-NIS, 664-NES
 XP_023410960.1 Mammalia 53-NIT, 154-NST, 252-NQT, 298-NAT, 541-NST, 596-NSS, 655-NQT, 685-NAS
 XP_023575315.1 Mammalia 79-NIT, 116-NLT, 458-NET, 572-NST, 716-NIS, 817-NNT
 XP_023609437.1 Mammalia 53-NIT, 90-NST, 103-NGS, 215-NYS, 279-NLT, 328-NNS, 431-NET, 674-NQT, 704-NMS, 799-NLS
 XP_023774184.1 Aves **24-NVT**, 57-NIT, 83-NAS, 140-NNS, 141-NSS, 539-NHT, 551-NST, 603-NNS
 XP_023964517.1 Reptilia 52-NIT, 78-NAS, 329-NNS, 387-NLS, 432-NET, 534-NHT, 546-NST, 580-NAT, 598-NNS, 633-NSS, 710-NVS
 XP_023971279.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 659-NET, 689-NVS, 790-NNS
 XP_024150631.1 Actinopterygii 58-NIT, 394-NLS, 474-NIS
 XP_024425698.1 Mammalia 53-NIT, 279-NLT, 386-NQS, 431-NET, 545-NST, 659-NQT, 784-NLS
 XP_024599894.1 Mammalia 53-NIT, 298-NQS, 321-NMT, 545-NST, 600-NSS, 659-NET, 689-NMS, 790-NNS
 XP_025066628.1 Reptilia 48-NIT, 74-NAS, 299-NAS, 382-NLT, 575-NAT, 593-NNT, 602-NTT, 685-NTS
 XP_025227847.1 Mammalia 53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS
 XP_025292925.1 Mammalia 52-NIT, 215-NYS, 298-NQS, 321-NMT, 545-NSS, 659-NQT, 689-NVS
 XP_025713397.1 Mammalia 53-NIT, 216-NYS, 299-NQS, 322-NMT, 432-NET, 546-NSS, 690-NMS, 785-NLS
 XP_025790417.1 Mammalia 53-NIT, 90-NTT, 216-NYS, 299-NQS, 322-NMT, 580-NVT, 690-NVS
 XP_025842512.1 Mammalia 52-NIS, 215-NYS, 298-NQS, 321-NMT, 545-NSS, 689-NVS
 XP_025891105.1 Aves 52-NIT, 78-NAS, 322-NMT, 329-NNS, 467-NIT, 546-NST, 580-NAT, 598-NNS, 636-NSS, 690-NVS, 777-NST
 XP_025942946.1 Aves 52-NIT, 78-NAS, 322-NMT, 329-NYS, 467-NIT, 546-NST, 572-NIT, 580-NAT, 598-NNS, 690-NVS
 XP_026020155.1 Actinopterygii 54-NIT, 390-NLS, 470-NIT, 662-NKT
 XP_026131313.1 Actinopterygii 320-NMS, 388-NHS, 547-NST, 785-NKT
 XP_026175949.1 Actinopterygii 54-NIT, 331-NNS, 390-NLS, 470-NIT, 435-NET, 470-NIT, 606-NRT, 664-NES
 XP_026233431.1 Actinopterygii 155-NST, 331-NNS, 390-NQS, 664-NET
 XP_026252505.1 Mammalia 63-NIT, 100-NFT, 164-NST, 332-NMT, 442-NET, 556-NST, 670-NQT, 700-NVS, 782-NQT
 XP_026333865.1 Mammalia 53-NIT, 90-NST, 216-NYS, 322-NMT, 432-NET, 546-NSS, 690-NVS
 XP_026570054.1 Reptilia 66-NAS, 77-NLT, 114-NET, 178-NYS, 309-NKT, 344-NMT, 631-NWT, 682-NKT, 712-NIS, 815-NST
 XP_026705725.1 Aves 77-NIT, 103-NAS, 178-NST, 354-NNS, 559-NHT, 623-NNS, 715-NIS
 XP_026803610.1 Actinopterygii 52-NIT, 318-NMS, 546-NST, 692-NAS, 789-NGT
 XP_026867211.2 Actinopterygii 52-NIT, 77-NES, 546-NAT, 692-NAS, 798-NDS
 XP_026910297.1 Mammalia 53-NIT, 90-NTT, 216-NYS, 299-NQS, 322-NMT, 546-NSS, 580-NVT, 690-NVS
 XP_026951598.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 614-NQS, 635-NDS, 659-NKT, 689-NMS
 XP_027024524.1 Actinopterygii 53-NIT, 319-NMS, 329-NNS, 388-NLS, 547-NST, 693-NAT, 799-NES
 XP_027389727.1 Mammalia 53-NIT, 90-NLT, 298-NQS, 431-NET, 545-NST, 659-NET, 689-NVS
 XP_027465353.1 Mammalia 53-NIT, 216-NYS, 299-NQS, 322-NMT, 432-NET, 546-NSS, 690-NMS, 785-NLS
 XP_027494818.1 Aves **39-NIS**, 54-NIT, 80-NAS, 196-NYS, 324-NMT, 536-NHT, 548-NST, 582-NAT, 600-NNS, 692-NIS
 XP_027544864.1 Aves 80-NAS, 196-NYS, 305-NAT, 536-NHT, 548-NST, 582-NAT, 600-NNS, 692-NIS
 XP_027593974.1 Aves **39-NIS**, 54-NIT, 80-NAS, 196-NYS, 324-NMT, 536-NHT, 548-NST, 582-NAT, 600-NNS, 692-NIS
 XP_027691156.1 Mammalia 80-NIS, 324-NMT, 548-NST, 582-NAT, 692-NGS, 773-NKS

XP_027757151.1	Aves	52-NIT, 78-NAS, 194-NYS, 303-NAT, 546-NST, 580-NAT, 598-NNS, 690-NIS
XP_027802308.1	Mammalia	63-NIT, 100-NFT, 164-NST, 332-NMT, 442-NET, 556-NST, 619-NWS, 670-NQT, 700-NAS, 782-NQT
XP_027871671.1	Actinopterygii	37-NAS , 391-NLS, 471-NIS
XP_027970822.1	Mammalia	53-NIT, 216-NYS, 299-NQS, 322-NMT, 432-NET, 546-NSS, 690-NMS, 785-NLS
XP_028020351.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 321-NMT, 431-NVT, 545-NST, 659-NET, 689-NVS, 790-NNS
XP_028257887.1	Actinopterygii	55-NIT, 159-NYS, 332-NNS, 391-NLS, 436-NET, 471-NIT, 550-NST, 679-NET
XP_028297875.1	Actinopterygii	48-NAS, 66-NIT, 170-NYS, 229-NYT, 342-NNS, 401-NLS, 446-NET, 560-NST, 675-NET, 689-NET
XP_028378317.1	Mammalia	53-NIT, 319-NMT, 429-NET, 491-NET, 543-NST, 688-NDT, 784-NLS
XP_028441363.1	Actinopterygii	155-NST, 331-NNS, 390-NLS, 470-NIT, 549-NST, 606-NRT, 630-NSS, 676-NKT
XP_028617961.1	Mammalia	53-NIT, 82-NFS, 546-NST, 572-NVT, 615-NQS, 660-NQT, 690-NAS
XP_028655640.1	Actinopterygii	52-NIT, 78-NAT, 89-NYT, 150-NST, 318-NMT, 325-NNS, 530-NHS, 542-NST, 576-NAT, 662-NFT, 685-NQS, 786-NGS
XP_028743609.1	Mammalia	53-NIT, 82-NYS, 546-NST, 658-NKT, 690-NVS, 772-NET
XP_028837781.1	Actinopterygii	35-NAT , 53-NIT, 330-NNS, 390-NLT, 549-NST, 796-NNS
XP_028999570.1	Actinopterygii	61-NIS, 397-NLS, 671-NQS
XP_029095804.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 659-NET, 689-NMS, 790-NNS
XP_029140508.1	Reptilia	41-NAS , 52-NIT, 78-NAS, 89-NET, 153-NYS, 284-NKT, 319-NMT, 543-NST, 595-NNS, 606-NWT, 657-NKT, 687-NIS
XP_029283581.1	Actinopterygii	54-NIT, 331-NKS, 390-NLS, 430-NFT, 470-NIT, 534-NAS, 664-NET, 694-NLS
XP_029354066.1	Actinopterygii	43-NYS , 54-NIT, 158-NYS, 331-NNS, 390-NLS, 435-NET, 470-NIT, 673-NQT, 687-NLT
XP_029459086.1	Amphibia	52-NIT, 78-NSS, 257-NKT, 301-NWT, 387-NLS, 432-NET, 534-NHS, 546-NST, 598-NNT, 662-NQT, 692-NLS
XP_029702274.1	Actinopterygii	26-NQT, 45-NYS , 56-NIT, 81-NES, 160-NYS, 307-NET, 432-NFT, 472-NIT, 539-NHT, 608-NRT, 666-NET
XP_029786256.1	Mammalia	53-NIT, 90-NTT, 216-NYS, 546-NST, 690-NVS
XP_029855025.1	Aves	37-NIS , 52-NIT, 78-NAS, 153-NST, 329-NNS, 534-NHT, 546-NSS, 598-NNS, 690-NIS
XP_029904152.1	Actinopterygii	54-NIT, 331-NNS, 390-NLS, 470-NIT, 537-NHT, 664-NMT
XP_029949252.1	Actinopterygii	54-NIT , 62-NVT, 158-NYS, 389-NLS, 429-NFT, 533-NAS, 672-NRT
XP_030058174.1	Amphibia	19-NVT , 52-NIT, 78-NSS, 153-NST, 387-NLS, 546-NST, 580-NST, 598-NNT, 617-NDS, 662-NQT, 676-NET, 792-NIT
XP_030160839.1	Mammalia	53-NIT, 90-NTT, 216-NYS, 299-NQS, 322-NMT, 546-NSS, 580-NVT, 660-NQT, 690-NVS
XP_030232530.1	Actinopterygii	228-NYT, 400-NLS, 559-NST, 675-NKT, 805-NLS
XP_030332639.1	Aves	39-NIS , 54-NIT, 80-NAS, 155-NST, 196-NYS, 331-NNS, 536-NHT, 600-NNS, 692-NIS
XP_030407881.1	Reptilia	52-NIT, 78-NAS, 329-NNS, 387-NLS, 432-NET, 534-NHT, 546-NST, 580-NAT, 598-NNS, 660-NQT, 690-NTS
XP_030582139.1	Actinopterygii	54-NIT, 390-NLS, 470-NIT, 549-NST, 662-NET, 796-NDS
XP_030627971.1	Actinopterygii	34-NAT , 52-NIT, 328-NNS, 432-NET, 546-NST, 575-NHT
XP_030703991.1	Mammalia	53-NIT, 90-NLT, 298-NQS, 321-NMT, 545-NST, 614-NQS, 659-NKT, 689-NMS
XP_030811385.1	Aves	52-NIT, 78-NAS, 329-NNS, 546-NST, 598-NNS, 690-NIS
XP_031162227.1	Actinopterygii	54-NIS, 331-NNS, 390-NLS, 470-NIS, 549-NST, 606-NRT, 664-NKT, 678-NET
XP_031226742.1	Mammalia	54-NIT, 83-NFS, 300-NQS, 547-NST, 691-NVS, 773-NET
XP_031414786.1	Actinopterygii	60-NIT, 336-NDS, 395-NLS, 440-NET, 554-NST
XP_031451919.1	Aves	52-NIT, 78-NAS, 194-NYS, 280-NLT, 322-NMT, 534-NHT, 546-NST, 580-NAT, 598-NNS, 690-NVS
XP_031584810.1	Actinopterygii	390-NLS, 470-NIT, 681-NKT, 710-NAT
XP_031702716.1	Actinopterygii	62-NIT, 84-NMS, 98-NDT, 398-NLS, 443-NDT, 557-NST, 614-NRT, 672-NES
XP_031956594.1	Aves	39-NIS , 54-NIT, 80-NAS, 324-NMT, 536-NHT, 548-NST, 600-NNS, 692-NIS
XP_032058386.1	Aves	52-NIT, 78-NAS, 322-NMT, 534-NHT, 546-NST, 580-NAT, 598-NNS, 687-NVS
XP_032082934.1	Reptilia	77-NLT, 103-NAS, 114-NET, 130-NSS, 176-NWS, 309-NKT, 351-NNS, 631-NWT, 656-NWT, 682-NKT, 712-NIS, 815-NST
XP_032141854.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 609-NWS, 690-NVS
XP_032187677.1	Mammalia	53-NIT, 299-NQS, 322-NMT, 660-NQT, 690-NMS
XP_032245506.1	Mammalia	53-NIT, 216-NYS, 322-NMT, 432-NET, 546-NSS, 660-NQT, 690-NVS, 785-NLS
XP_032355526.1	Actinopterygii	54-NIT, 331-NNS, 390-NLS, 470-NIT, 549-NST, 606-NRT, 664-NET
XP_032417398.1	Actinopterygii	37-NAS , 391-NLS, 471-NIS
XP_032476001.1	Mammalia	53-NIT, 298-NQS, 321-NMT, 545-NST, 600-NSS, 659-NET, 689-NMS, 790-NNS
XP_032536093.1	Aves	54-NIT, 80-NAS, 196-NYS, 324-NMT, 536-NHT, 548-NST, 582-NAT, 692-NIS
XP_032612508.1	Mammalia	53-NIT, 90-NLT, 103-NGS, 322-NMT, 432-NET, 546-NST, 690-NVS, 772-NKS
XP_032631197.1	Reptilia	52-NIT, 78-NAS, 153-NST, 329-NNS, 387-NLS, 432-NET, 534-NHT, 546-NST, 580-NAT, 598-NNS, 660-NQT, 690-NTS
XP_032736028.1	Mammalia	53-NIT, 216-NYS, 322-NMT, 690-NMS
XP_032746145.1	Mammalia	53-NIT, 82-NFS, 299-NQS, 546-NST, 601-NST, 648-NQT, 678-NVS, 760-NET
XP_032865981.1	Aves	52-NIT, 78-NAS, 329-NNS, 534-NHT, 598-NNS, 690-NIS
XP_032888812.1	Chondrichthyes	78-NAS, 280-NFS, 329-NYS, 388-NQT, 535-NQT, 547-NST, 581-NST, 693-NIT
XP_032907631.1	Aves	7-NRS, 101-NIS, 116-NIT, 142-NAS, 393-NNS, 598-NHT, 610-NST, 644-NAT, 662-NNS, 754-NVT
XP_032963186.1	Mammalia	38-NLS , 53-NIS, 82-NFS, 90-NDT, 322-NMT, 329-NNS, 432-NET, 546-NST, 660-NQT, 690-NLS
XP_033806113.1	Amphibia	52-NIT, 78-NSS, 153-NST, 299-NKS, 329-NNS, 432-NET, 546-NST, 598-NNT, 617-NDS, 676-NET
XP_034290793.1	Reptilia	66-NAS , 77-NLT, 103-NAS, 114-NET, 126-NGS, 178-NYS, 309-NKT, 344-NMT, 568-NST, 620-NNS, 631-NWT, 682-NKT, 711-NNT, 712-NTS, 815-NST
XP_034341939.1	Mammalia	53-NIT, 82-NFS, 299-NQS, 546-NST, 572-NVT, 660-NQT, 690-NAS, 772-NET
XP_034505781.1	Mammalia	53-NIT, 90-NST, 216-NYS, 322-NMT, 432-NET, 546-NSS, 690-NVS
XP_034612285.1	Reptilia	52-NIT, 78-NAS, 329-NNS, 387-NLS, 432-NET, 534-NHT, 546-NST, 580-NAT, 598-NNS, 633-NSS, 680-NQT, 710-NVS
XP_034852450.1	Mammalia	53-NIT, 216-NYS, 299-NQS, 322-NMT, 432-NET, 690-NVS, 785-NLS
XP_034971718.1	Reptilia	52-NIT, 78-NAS, 303-NVT, 329-NNS, 387-NLS, 546-NST, 690-NGT
XP_035182951.1	Aves	19-NVT , 52-NIT, 78-NAS, 322-NMT, 546-NST, 572-NLT, 598-NNS, 690-NVS
XP_035398116.1	Aves	52-NIT, 78-NAS, 322-NMT, 546-NST, 572-NLT, 580-NAT, 598-NNS, 690-NVS
XP_416822.2	Aves	52-NIT, 78-NAS, 194-NYS, 280-NLT, 322-NMT, 534-NHT, 546-NST, 580-NAT, 598-NNS, 690-NVS

Table S7. Comparison of the interface residues in the 285 ACE2 proteins. Interface residue positions are indexed by hACE2. ‘-’ stands for a gap, and ‘*’ for the same amino acid type as that of hACE2.

Species	24	27	28	30	31	34	35	37	38	41	42	79	82	83	330	353	354	355	357	393	
<i>Homo sapiens</i>	Q	T	F	D	K	H	E	E	D	Y	Q	L	M	Y	N	K	G	D	R	R	
<i>Pongo abelii</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Pan paniscus</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Nomascus leucogenys</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Gorilla gorilla</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Papio anubis</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Hylobates moloch</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Chlorocebus sabaeus</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Macaca nemestrina</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Macaca fascicularis</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Theropithecus gelada</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Macaca mulatta</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Cercocebus atys</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Rhinopithecus roxellana</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Pan troglodytes</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Mandrillus leucophaeus</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Ptiliocolobus tephrosceles</i>	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Mesocricetus auratus</i>	*	*	*	*	*	Q	*	*	*	*	*	*	N	*	*	*	*	*	*	*	*
<i>Cricetulus griseus</i>	*	*	*	*	*	Q	*	*	*	*	*	*	N	*	*	*	*	*	*	*	*
<i>Nannospalax galili</i>	*	*	*	*	*	Q	*	*	*	*	*	*	K	*	*	*	*	*	*	*	*
<i>Eumetopias jubatus</i>	L	*	*	E	S	*	*	E	*	*	Q	T	*	*	*	*	H	*	*	*	*
<i>Propithecus coquereli</i>	*	*	*	*	*	*	*	*	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Callorhinus ursinus</i>	L	*	*	E	S	*	*	E	*	*	Q	T	*	*	*	*	H	*	*	*	*
<i>Equus caballus</i>	L	*	*	E	S	*	*	E	H	*	*	T	*	*	*	*	*	*	*	*	*
<i>Equus przewalskii</i>	L	*	*	E	S	*	*	E	H	*	*	T	*	*	*	*	*	*	*	*	*
<i>Panthera tigris altaica</i>	L	*	*	E	*	*	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Acinonyx jubatus</i>	L	*	*	E	*	*	*	E	*	*	*	T	*	*	K	*	*	*	*	*	*
<i>Capra hircus</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Oryctolagus cuniculus</i>	L	*	*	E	*	Q	*	*	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Bos mutus</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Puma concolor</i>	L	*	*	E	*	*	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Heterocephalus glaber</i>	*	*	*	*	Q	*	*	*	*	*	*	A	*	*	*	*	D	*	*	*	*
<i>Bison bison bison</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Panthera pardus</i>	L	*	*	E	*	*	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Mustela erminea</i>	L	*	*	E	*	Y	*	E	*	*	H	T	*	*	*	*	R	*	*	*	*
<i>Phoca vitulina</i>	L	*	*	E	*	Y	*	E	*	*	Q	T	*	*	*	*	R	*	*	*	*
<i>Bos taurus</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Bos indicus x Bos taurus</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Lontra canadensis</i>	L	*	*	E	*	Y	*	E	*	*	N	T	*	*	*	*	R	*	*	*	*
<i>Odobenus rosmarus divergens</i>	L	*	*	E	*	Y	*	E	*	*	Q	T	*	*	*	*	H	*	*	*	*
<i>Neomonachus schauinslandi</i>	L	*	*	E	*	Y	*	E	*	*	Q	T	*	*	*	*	H	*	*	*	*
<i>Mustela putorius furo</i>	L	*	*	E	*	Y	*	E	*	*	H	T	*	*	*	*	R	*	*	*	*
<i>Zalophus californianus</i>	L	*	*	E	*	S	*	E	*	*	Q	T	*	*	*	*	H	*	*	*	*
<i>Bos indicus</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Bubalus bubalis</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Jaculus jaculus</i>	M	*	*	*	Q	*	*	*	*	*	*	V	T	*	*	*	N	*	*	*	*
<i>Peromyscus maniculatus bairdii</i>	*	I	*	*	Q	*	*	*	*	*	*	N	*	*	*	*	*	*	*	*	*
<i>Felis catus</i>	L	*	*	E	*	*	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Odocoileus virginianus texanus</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Fukomys damarensis</i>	*	*	*	*	Q	*	*	*	*	*	*	A	*	*	*	*	N	*	*	*	*
<i>Lynx canadensis</i>	L	*	*	E	*	*	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Ailuropoda melanoleuca</i>	L	*	*	E	*	Y	*	*	*	*	H	T	*	*	*	*	*	*	*	*	*
<i>Peromyscus leucopus</i>	*	I	*	*	Q	*	*	*	*	*	*	N	*	*	*	*	*	*	*	*	*
<i>Ursus arctos horribilis</i>	L	*	*	E	*	Y	*	*	*	*	H	T	*	*	*	*	*	*	*	*	*
<i>Ovis aries</i>	*	*	*	E	*	*	*	*	*	*	*	M	T	*	*	*	*	*	*	*	*
<i>Delphinapterus leucas</i>	*	*	*	Q	*	*	*	*	*	*	*	I	T	*	*	*	*	*	*	*	*
<i>Monodon monoceros</i>	*	*	*	Q	*	*	*	*	*	*	*	I	T	*	*	*	*	*	*	*	*
<i>Phocoena sinus</i>	*	*	*	Q	*	*	*	*	*	*	*	I	T	*	*	*	*	*	*	*	*
<i>Physeter macrocephalus</i>	*	*	*	Q	*	*	*	*	*	*	*	T	T	*	*	*	*	*	*	*	*
<i>Ursus maritimus</i>	L	*	*	E	*	Y	*	*	*	*	H	T	*	*	*	*	*	*	*	*	*
<i>Neophocaena asiaeorientalis asiaeorientalis</i>	*	*	*	Q	*	*	*	*	*	*	*	I	T	*	*	*	*	*	*	*	*
<i>Microtus ochrogaster</i>	D	A	*	*	Q	*	*	*	*	*	*	S	*	*	*	*	D	*	*	*	*
<i>Manis javanica</i>	E	*	*	E	*	S	*	*	E	*	*	I	N	*	*	*	H	*	*	*	*
<i>Balaenoptera acutorostrata scammoni</i>	*	*	*	Q	*	*	*	*	*	*	R	I	T	*	*	*	*	*	*	*	*
<i>Marmota marmota</i>	L	*	*	*	*	Q	*	*	*	*	*	A	*	*	*	*	*	*	*	*	*
<i>Vulpes vulpes</i>	L	*	*	E	*	Y	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Ictidomys tridecemlineatus</i>	L	*	*	*	*	Q	*	*	*	*	*	A	*	*	*	*	*	*	*	*	*
<i>Marmota flaviventris</i>	L	*	*	*	*	Q	*	*	*	*	*	A	*	*	*	*	*	*	*	*	*
<i>Canis lupus familiaris</i>	L	*	*	E	*	Y	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Canis lupus dingo</i>	L	*	*	E	*	Y	*	E	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Ceratotherium simum simum</i>	L	*	*	E	*	P	*	*	*	*	*	T	*	*	*	*	*	*	*	*	*
<i>Ochotona princeps</i>	L	*	*	*	*	Q	*	*	*	*	*	T	*	*	*	*	D	*	*	*	*
<i>Rousettus aegyptiacus</i>	L	*	*	E	*	T	*	*	*	*	*	T	*	K	*	*	*	*	*	*	*
<i>Sus scrofa</i>	L	*	*	E	*	L	*	*	*	*	*	I	T	*	*	*	*	*	*	*	*
<i>Urocyon parryi</i>	L	*	*	*	*	Q	*	*	*	H	*	D	*	*	*	*	*	*	*	*	*
<i>Lagenorhynchus obliquidens</i>	R	*	*	Q	*	R	*	*	*	*	*	I	T	*	*	*	*	*	*	*	*

<i>Nyctereutes procyonoides</i>	L	*	*	E	*	Y	*	*	E	*	*	*	T	*	*	R	*	*	*	*
<i>Equus asinus</i>	L	*	*	E	*	S	*	*	E	*	*	H	*	*	*	*	*	*	*	*
<i>Rhinolophus sinicus</i>	E	M	*	*	*	T	K	*	*	*	*	*	N	*	*	*	*	*	*	*
<i>Camelus bactrianus</i>	L	*	*	E	E	*	*	*	*	*	*	*	T	T	*	*	*	*	*	*
<i>Mirounga leonina</i>	L	K	*	E	E	Y	*	*	E	*	*	*	Q	T	*	*	H	*	*	*
<i>Camelus dromedarius</i>	L	*	*	E	E	*	*	*	*	*	*	*	T	T	*	*	*	*	*	*
<i>Phyllostomus discolor</i>	D	K	*	E	N	N	*	*	E	*	*	*	T	N	*	*	*	K	*	*
<i>Camelus ferus</i>	L	*	*	E	E	*	*	*	*	*	*	*	T	T	*	*	*	*	*	*
<i>Orcinus orca</i>	R	*	*	Q	*	R	*	*	*	*	*	*	I	T	*	*	*	*	*	*
<i>Pteropus vampyrus</i>	L	*	*	E	*	T	*	*	*	*	*	*	A	*	K	*	*	*	*	K
<i>Pteropus alecto</i>	L	*	*	E	*	T	*	*	*	*	*	*	A	*	K	*	*	*	*	K
<i>Globicephala melas</i>	R	*	*	Q	*	R	*	*	*	*	*	I	T	*	*	*	*	*	*	*
<i>Tursiops truncatus</i>	R	*	*	Q	*	R	*	*	*	*	*	I	T	*	*	*	*	*	*	*
<i>Lipotes vexillifer</i>	R	*	*	Q	*	*	*	*	*	*	*	I	T	F	*	*	*	*	*	*
<i>Dipodomys ordii</i>	L	*	*	*	N	Q	*	*	*	*	*	*	I	*	*	*	*	*	*	*
<i>Loxodonta africana</i>	L	*	*	*	T	Q	*	*	*	*	*	*	D	F	*	*	*	*	*	*
<i>Orycteropus afer</i>	L	*	*	E	*	Q	*	*	N	*	*	I	S	F	K	*	*	*	*	*
<i>Enhydra lutris kenyonii</i>	P	*	*	E	*	Y	*	*	E	*	*	H	T	*	*	*	R	*	*	*
<i>Trichechus manatus latirostris</i>	L	*	*	*	T	Q	*	*	*	*	*	*	N	F	*	*	*	*	*	*
<i>Paguma larvata</i>	L	*	*	E	T	Y	Q	E	*	*	*	*	T	*	*	*	*	*	*	*
<i>Octodon degus</i>	*	*	*	*	N	Q	K	*	*	*	*	*	A	*	*	*	N	*	*	*
<i>Vicugna pacos</i>	L	*	*	K	E	*	*	*	*	*	*	A	I	*	*	*	*	*	*	*
<i>Callithrix jacchus</i>	*	*	*	*	*	*	*	*	*	*	H	E	*	T	*	*	Q	*	*	*
<i>Saimiri boliviensis</i>	*	*	*	*	*	*	*	*	*	*	H	E	*	T	*	*	Q	*	*	*
<i>Otoleonur garnettii</i>	*	*	*	*	N	R	*	*	E	H	*	I	T	*	*	*	D	*	*	*
<i>Eptesicus fuscus</i>	N	I	*	E	N	S	*	*	*	H	E	*	T	*	*	*	N	*	*	*
<i>Myotis brandtii</i>	K	I	*	E	N	S	K	*	*	H	E	*	T	*	*	*	*	*	*	*
<i>Aotus nancymae</i>	*	*	*	*	*	*	*	*	*	H	E	*	T	*	*	*	Q	*	*	*
<i>Cyanistes caeruleus</i>	E	E	*	E	E	R	R	*	*	*	E	N	N	F	*	*	N	*	*	*
<i>Sapajus apella</i>	*	*	*	*	*	*	*	*	*	H	E	*	T	*	*	*	Q	*	*	*
<i>Myotis davidii</i>	K	I	*	*	N	S	K	*	*	H	E	*	T	*	*	*	*	*	*	*
<i>Chinchilla lanigera</i>	*	*	*	*	N	E	K	*	*	*	*	*	A	*	*	*	D	*	*	*
<i>Carlito syrichta</i>	*	*	*	*	*	Q	*	*	*	H	*	I	S	*	*	N	S	*	*	*
<i>Suricata suricatta</i>	L	*	*	E	Q	*	*	Q	E	*	L	R	A	*	*	*	*	*	*	*
<i>Condylura cristata</i>	*	K	*	E	T	R	*	*	E	*	N	D	R	F	*	*	*	*	*	*
<i>Microcebus murinus</i>	*	*	*	E	N	N	*	*	*	H	*	*	T	*	K	*	*	*	*	*
<i>Myotis lucifugus</i>	K	I	*	E	N	S	K	*	*	H	E	*	T	*	*	*	*	*	*	*
<i>Dasylops novemcinctus</i>	*	*	*	E	T	S	Q	*	E	H	*	M	N	F	*	*	*	*	*	*
<i>Echinops telfairi</i>	*	S	*	T	T	N	*	*	N	*	*	*	K	F	K	L	N	*	*	*
<i>Nothoprocta perdicaria</i>	E	V	*	*	E	I	K	*	*	*	E	N	K	F	*	*	K	*	*	*
<i>Chrysochloris asiatica</i>	L	A	*	N	N	Q	*	*	N	H	*	*	K	F	*	*	D	*	*	*
<i>Mus pahari</i>	N	*	*	N	*	Q	*	*	*	*	*	T	N	F	*	H	*	*	*	*
<i>Rhinolophus ferrumequinum</i>	L	K	*	*	D	S	*	*	N	H	*	*	N	F	*	*	*	*	*	*
<i>Mastomys coucha</i>	N	*	*	N	*	Q	*	*	*	*	*	I	N	F	*	H	*	*	*	*
<i>Monodelphis domestica</i>	D	*	*	*	D	A	K	*	E	H	*	I	T	*	*	*	N	*	*	*
<i>Serinus canaria</i>	*	K	*	*	E	R	R	*	*	*	E	N	K	F	*	*	N	*	*	*
<i>Grammomys surdaster</i>	E	*	*	*	*	Q	*	*	*	*	*	T	N	F	*	H	*	*	*	*
<i>Hipposideros armiger</i>	L	E	*	*	*	T	*	*	*	H	L	R	D	*	*	*	*	*	*	*
<i>Sturnus vulgaris</i>	E	I	*	E	E	R	R	*	*	*	E	N	S	F	*	*	N	*	*	*
<i>Tupaia chinensis</i>	E	V	*	N	*	I	*	*	E	H	*	Q	R	*	K	*	N	*	*	*
<i>Calidris pugnax</i>	*	M	*	E	E	R	M	V	*	*	E	N	C	F	*	*	N	*	*	K
<i>Gekko japonicus</i>	R	E	*	E	Q	P	R	*	N	*	E	M	S	F	*	*	*	*	*	*
<i>Chrysemys picta</i>	E	N	*	S	Q	V	R	*	*	*	A	N	K	*	*	*	K	*	*	*
<i>Desmodus rotundus</i>	E	*	*	E	N	T	*	*	E	*	*	I	T	*	*	N	K	*	*	*
<i>Rattus rattus</i>	K	S	*	N	*	Q	*	*	*	*	*	I	N	F	*	H	*	*	*	*
<i>Mus caroli</i>	N	*	*	N	*	Q	*	*	*	*	*	T	S	F	*	H	*	*	*	*
<i>Geotrypetes seraphini</i>	E	V	*	*	Q	P	K	*	*	*	*	N	R	*	*	N	*	*	*	*
<i>Struthio camelus australis</i>	*	M	*	T	E	V	K	*	*	*	E	N	N	F	*	*	K	*	*	*
<i>Rattus norvegicus</i>	K	S	*	N	*	Q	*	*	*	*	*	I	N	F	*	H	*	*	*	*
<i>Falco cherrug</i>	E	M	*	E	E	R	R	*	N	*	E	N	S	F	*	*	N	*	*	*
<i>Aquila chrysaetos chrysaetos</i>	*	M	*	E	E	R	R	*	N	*	E	N	S	F	*	*	N	*	*	*
<i>Coturnix japonica</i>	E	K	*	A	E	V	R	*	*	*	E	N	R	F	*	*	N	*	*	*
<i>Pantherophis guttatus</i>	*	E	*	K	Q	V	R	I	*	*	N	*	*	F	*	*	N	*	*	*
<i>Danio rerio</i>	R	E	*	N	*	E	*	S	*	*	*	E	A	*	*	N	K	*	*	*
<i>Cygnus atratus</i>	*	M	*	A	E	V	R	*	*	*	E	N	S	F	*	*	N	*	*	*
<i>Miniopterus natalensis</i>	K	K	*	E	G	S	Q	Q	*	*	H	E	*	I	*	*	*	*	*	*
<i>Rhinatrema bivittatum</i>	*	E	*	R	Q	Q	Q	*	*	*	F	E	N	R	*	*	N	*	*	*
<i>Aptenodytes forsteri</i>	*	M	*	E	E	K	R	*	N	*	E	N	S	F	*	*	N	*	*	*
<i>Mus musculus</i>	N	*	*	N	N	Q	*	*	*	*	*	T	S	F	*	H	*	*	*	*
<i>Larimichthys crocea</i>	E	V	*	E	*	K	*	T	Q	*	*	*	Q	F	*	N	E	*	*	*
<i>Anas platyrhynchos</i>	*	M	*	A	E	V	R	*	*	*	E	N	N	F	*	*	N	*	*	*
<i>Phasianus colchicus</i>	E	*	*	A	E	A	R	*	*	*	E	N	R	F	*	*	N	*	*	*
<i>Corvus moneduloides</i>	*	M	*	E	E	R	R	*	N	*	E	N	S	F	*	*	N	*	*	*
<i>Opisthocomus hoazin</i>	*	L	*	E	E	R	R	*	*	*	E	N	S	F	*	*	N	*	*	*
<i>Camarhynchus parvulus</i>	*	*	*	E	E	M	R	*	*	*	E	N	K	F	*	*	N	*	*	*
<i>Ictalur punctatus</i>	R	E	*	Q	*	E	D	S	R	*	*	Q	A	F	*	N	E	*	*	*
<i>Chelonia mydas</i>	E	N	*	S	Q	V	R	*	*	*	A	N	K	*	*	K	*	*	*	*
<i>Oxyura jamaicensis</i>	*	M	*	A	E	V	R	*	N	*	E	N	S	F	*	*	N	*	*	*
<i>Aythya fuligula</i>	*	M	*	A	E	V	R	N	*	*	E	N	N	F	*	*	N	*	*	*
<i>Fundulus heteroclitus</i>	E	A	*	E	R	Q	N	S	E	*	*	E	K	*	*	N	E	*	*	*

<i>Elephantulus edwardii</i>	*	A	*	E	Q	Q	Q	*	*	*	*	V	N	F	*	*	*	*	*	
<i>Ficedula albicollis</i>	E	I	*	E	E	R	R	*	*	*	*	E	N	R	F	*	*	N	*	
<i>Pundamilia nyererei</i>	*	E	*	*	R	K	*	S	*	*	*	*	N	K	*	D	N	K	*	
<i>Mesitornis unicolor</i>	*	M	*	E	E	M	R	*	V	*	*	E	N	S	*	*	*	N	*	
<i>Gallus gallus</i>	E	*	*	A	E	V	R	*	*	*	*	E	N	R	F	*	*	N	*	
<i>Lates calcarifer</i>	*	E	*	Q	R	K	*	T	E	*	*	*	E	K	*	*	N	E	*	
<i>Chelonoidis abingdonii</i>	E	N	*	S	Q	V	R	*	*	*	*	A	N	K	F	*	*	K	*	
<i>Arvicanthus niloticus</i>	K	*	*	*	*	R	*	*	*	*	H	*	T	N	F	*	L	*	*	
<i>Thamnophis elegans</i>	*	E	*	K	Q	A	R	D	*	*	*	A	*	*	*	*	*	K	*	
<i>Oreochromis niloticus</i>	*	E	*	*	R	K	*	S	*	*	*	*	E	K	*	*	N	K	*	
<i>Melopsittacus undulatus</i>	*	M	*	E	E	R	R	K	*	*	*	D	N	S	F	*	*	N	*	
<i>Buceros rhinoceros silvestris</i>	E	N	*	E	Q	R	R	R	*	*	*	E	N	N	F	*	*	K	*	
<i>Meleagris gallopavo</i>	E	*	*	A	E	V	R	R	*	*	*	E	N	R	R	F	*	N	*	
<i>Tyto alba</i>	*	M	*	E	E	R	R	R	*	*	*	E	N	R	F	*	*	N	*	
<i>Betta splendens</i>	*	D	*	E	*	E	*	T	Q	*	*	*	E	K	F	E	N	E	*	
<i>Python bivittatus</i>	E	E	*	M	Q	V	R	D	*	*	*	D	N	K	F	*	*	K	*	
<i>Ornithorhynchus anatinus</i>	E	Q	*	T	Q	K	Q	S	*	*	*	*	N	K	F	*	*	N	*	
<i>Pangasianodon hypophthalmus</i>	R	E	*	Q	*	E	D	S	R	*	*	*	Q	A	F	*	N	E	*	
<i>Pseudopodoces humilis</i>	E	E	*	E	E	R	R	R	*	N	*	E	N	N	F	*	*	N	*	
<i>Zootoca vivipara</i>	E	D	*	M	Q	A	R	R	*	*	*	E	N	R	F	*	*	*	*	
<i>Chaetura pelagica</i>	*	M	*	E	E	R	K	*	*	*	*	E	N	N	F	*	*	K	*	
<i>Calypte anna</i>	*	M	*	E	E	R	R	R	*	*	H	E	N	S	F	*	*	*	*	
<i>Pygocentrus nattereri</i>	R	E	*	Q	*	E	D	S	R	*	*	*	E	A	F	*	N	E	*	
<i>Poecilia reticulata</i>	E	A	*	E	R	E	N	S	*	*	*	K	E	N	*	*	N	E	*	
<i>Nipponia nippon</i>	*	M	*	E	E	R	R	R	*	N	*	*	E	N	N	F	*	*	N	*
<i>Athene cunicularia</i>	*	M	*	E	E	R	R	R	*	*	*	E	N	S	F	*	*	N	*	
<i>Chlamydotis macqueenii</i>	*	M	*	E	E	R	R	R	*	N	*	*	E	N	S	F	*	*	N	*
<i>Microcaecilia unicolor</i>	E	R	*	S	Q	R	L	*	*	N	*	E	N	R	*	*	*	N	*	
<i>Pygoscelis adeliae</i>	*	M	*	E	E	K	R	R	*	N	*	*	E	N	S	F	*	*	N	*
<i>Notothenia coriiceps</i>	E	E	*	Q	*	E	*	T	Q	*	*	*	E	K	*	K	N	E	*	
<i>Parus major</i>	E	E	*	E	E	M	R	R	*	N	*	*	E	N	N	F	*	*	N	*
<i>Mastacembelus armatus</i>	E	N	*	Q	S	E	*	T	E	*	*	*	E	K	F	*	N	K	*	
<i>Zonotrichia albicollis</i>	*	M	*	V	E	R	R	R	*	*	*	E	N	K	F	*	*	N	*	
<i>Fulmarus glacialis</i>	*	M	*	Q	E	S	S	*	S	*	*	E	N	S	F	*	*	N	*	
<i>Gavia stellata</i>	*	M	*	E	E	K	R	R	*	N	*	*	E	N	S	F	*	*	N	*
<i>Astatotilapia calliptera</i>	*	E	*	*	R	K	*	S	*	*	*	*	E	K	*	D	N	K	*	
<i>Numida meleagris</i>	E	I	*	A	E	V	R	R	*	*	*	E	N	R	F	*	*	N	*	
<i>Taeniopygia guttata</i>	*	I	*	E	E	R	R	R	*	N	*	*	E	N	T	F	*	*	N	*
<i>Sorex araneus</i>	N	K	*	E	N	K	D	*	*	*	*	N	I	T	F	*	*	N	*	
<i>Sinocyclocheilus rhinoceros</i>	S	E	*	K	*	E	*	T	N	*	*	*	E	A	*	*	N	E	*	
<i>Poecilia mexicana</i>	E	A	*	E	R	E	N	S	*	*	*	K	E	N	*	*	N	E	*	
<i>Pseudonaja textilis</i>	M	E	*	K	Q	I	R	V	*	*	*	N	E	I	F	*	*	E	*	
<i>Salaria fasciatus</i>	R	E	*	*	Q	A	S	G	*	*	*	*	E	S	F	*	N	K	*	
<i>Pelodiscus sinensis</i>	E	N	*	S	E	V	Q	*	*	*	*	A	E	N	K	*	*	K	*	
<i>Perca flavescens</i>	K	E	*	Q	*	E	*	T	R	*	*	*	E	K	F	*	N	E	*	
<i>Merops nubicus</i>	*	M	*	E	E	W	R	*	S	*	*	E	N	-	-	*	*	N	*	
<i>Seriola dumerili</i>	K	E	*	Q	R	E	*	T	A	*	*	*	E	K	F	D	N	E	*	
<i>Thamnophis sirtalis</i>	*	E	*	K	Q	A	R	D	*	*	*	A	N	*	*	*	*	K	*	
<i>Phaethon lepturus</i>	*	M	*	E	E	R	R	R	*	*	*	E	N	S	F	*	*	N	*	
<i>Parambassis ranga</i>	D	K	*	Q	N	K	*	T	E	*	*	*	E	K	F	*	N	E	*	
<i>Neolamprologus brichardi</i>	*	E	*	*	R	K	*	S	*	*	*	*	E	K	*	H	N	K	*	
<i>Vombatus ursinus</i>	R	E	*	E	T	K	*	*	E	*	*	*	I	T	F	*	*	*	*	
<i>Trachemys scripta elegans</i>	E	N	*	S	Q	V	R	*	*	*	*	A	N	K	*	*	*	K	*	
<i>Apteryx rowi</i>	*	M	*	T	E	I	K	*	*	*	*	E	N	N	F	Y	*	K	*	
<i>Poecilia formosa</i>	E	A	*	E	R	E	N	S	*	*	*	K	E	N	*	*	N	E	*	
<i>Poecilia latipinna</i>	E	A	*	E	R	E	N	S	*	*	*	K	E	N	*	*	N	E	*	
<i>Carassius auratus</i>	S	E	*	K	*	E	*	T	N	*	*	*	E	A	*	*	N	E	*	
<i>Stegastes partitus</i>	*	E	*	Q	*	I	D	T	A	*	*	*	E	R	F	*	N	N	*	
<i>Denticeps clupeioides</i>	R	E	*	R	*	E	N	T	*	*	*	*	E	N	F	*	N	E	*	
<i>Gopherus evgoodei</i>	E	N	*	S	Q	V	R	R	*	*	*	A	N	K	F	*	*	K	*	
<i>Protothrips mucrosquamatus</i>	*	E	*	K	Q	A	R	D	*	*	*	N	N	*	F	*	*	K	*	
<i>Seriola lalandi dorsalis</i>	K	E	*	Q	R	E	*	T	A	*	*	*	E	K	F	D	N	E	*	
<i>Xenopus tropicalis</i>	*	D	*	K	R	Q	*	*	V	H	*	*	N	A	F	*	M	N	*	
<i>Charadrius vociferus</i>	*	M	*	Q	E	R	R	*	N	*	*	E	N	N	F	*	*	*	*	
<i>Anolis carolinensis</i>	*	E	*	L	Q	I	N	*	N	*	*	E	R	T	F	*	*	N	*	
<i>Lonchura striata domestica</i>	*	M	*	E	E	R	R	R	*	N	*	*	E	N	T	F	*	*	N	*
<i>Corapipo altera</i>	*	N	*	E	Q	R	M	*	N	*	*	E	N	S	F	*	L	N	*	
<i>Esox lucius</i>	S	E	*	K	W	R	*	T	*	*	*	K	E	S	F	*	N	Q	*	
<i>Maylandia zebra</i>	*	E	*	*	R	K	*	S	*	*	*	*	E	K	*	D	N	K	*	
<i>Neopelma chrysocephalum</i>	*	N	*	E	Q	R	M	*	*	*	*	E	N	S	F	*	*	N	*	
<i>Pogona vitticeps</i>	*	Q	*	M	E	A	Q	*	N	*	*	E	T	E	F	*	*	N	*	
<i>Catharus ustulatus</i>	E	K	*	E	E	S	R	R	*	N	*	*	E	N	K	F	*	N	*	
<i>Haliaeetus albicilla</i>	*	M	*	E	E	R	R	R	*	N	*	E	-	S	F	*	*	N	*	
<i>Corvus brachyrhynchos</i>	*	M	*	E	E	R	R	R	*	N	*	E	-	-	-	*	*	N	*	
<i>Haplochromis burtoni</i>	*	E	*	*	R	K	*	S	*	*	*	*	E	K	*	D	N	K	*	
<i>Manacus vitellinus</i>	*	N	*	E	Q	R	M	*	N	*	*	E	N	S	F	*	N	N	*	
<i>Cynoglossus semilaevis</i>	*	E	*	E	*	E	*	S	A	*	*	*	N	E	K	F	*	N	M	*
<i>Empidonax traillii</i>	*	Q	*	E	Q	R	M	*	*	*	*	E	N	G	F	*	*	N	*	
<i>Archocentrus centrarchus</i>	*	Q	*	E	*	K	*	S	E	*	*	*	E	K	*	D	N	K	*	
<i>Amphiprion ocellaris</i>	*	E	*	K	N	T	*	T	V	*	*	*	E	K	F	*	N	E	*	

<i>Hippocampus comes</i>	E	D	*	R	*	E	*	S	E	*	*	Q	K	F	*	N	K	*	*	*
<i>Myripristis murdjan</i>	R	V	*	Q	R	R	*	T	V	*	*	E	N	N	*	N	E	*	*	*
<i>Corvus cornix cornix</i>	*	M	*	E	E	R	R	*	N	*	E	N	S	F	*	R	N	*	*	*
<i>Amblyraja radiata</i>	E	E	*	A	T	R	E	*	Q	*	K	N	K	F	Y	N	N	*	*	*
<i>Lepidothrix coronata</i>	*	N	*	E	Q	R	M	*	N	*	E	N	S	F	*	N	N	*	*	*
<i>Alligator mississippiensis</i>	-	*	*	N	Q	Q	N	*	G	*	E	N	K	*	*	M	K	*	*	*
<i>Alligator sinensis</i>	-	*	*	N	Q	Q	N	*	G	*	E	N	K	*	*	M	K	*	*	*
<i>Nothobranchius furzeri</i>	*	D	*	Q	R	Q	N	T	A	*	*	E	K	*	*	N	E	*	*	*
<i>Sander lucioperca</i>	K	E	*	Q	*	E	*	T	R	*	*	E	K	F	*	N	E	*	*	*
<i>Crocodylus porosus</i>	-	V	*	N	Q	Q	D	*	G	*	E	N	R	*	*	N	K	*	*	*
<i>Erinaceus europaeus</i>	E	K	*	*	D	R	Q	*	N	*	E	T	N	*	*	N	*	*	*	*
<i>Pipra filicauda</i>	*	N	*	E	Q	R	M	*	N	*	E	N	S	F	*	N	N	*	*	*
<i>Sinocyclocheilus anshuiensis</i>	S	E	*	K	*	E	*	T	N	*	*	E	A	*	*	N	E	*	*	*
<i>Gavialis gangeticus</i>	-	*	*	N	Q	Q	D	*	G	*	E	N	R	*	*	N	K	*	*	*
<i>Xiphophorus hellerii</i>	E	A	*	E	R	Q	N	S	E	*	K	E	N	*	*	N	E	*	*	*
<i>Strigops habroptila</i>	*	M	*	E	R	R	R	*	N	*	E	N	T	F	*	*	N	*	*	*
<i>Acanthochromis polyacanthus</i>	R	E	*	K	D	T	N	T	E	*	*	E	Q	F	*	N	E	*	*	*
<i>Nanorana parkeri</i>	D	V	*	Q	E	N	V	*	Q	H	*	F	R	*	K	L	D	*	*	*
<i>Erpetoichthys calabaricus</i>	K	Q	*	N	D	I	*	P	I	*	*	N	D	F	*	N	K	*	*	*
<i>Oreochromis aureus</i>	*	E	*	*	R	K	*	S	*	*	*	E	K	*	D	N	K	*	*	*
<i>Kryptolebias marmoratus</i>	E	D	*	L	*	E	N	T	A	*	*	E	K	*	*	N	E	*	*	*
<i>Etheostoma spectabile</i>	K	E	*	Q	M	E	*	T	Q	*	*	E	K	F	*	N	E	*	*	*
<i>Anarrhichthys ocellatus</i>	K	V	*	K	M	K	*	T	Q	*	*	E	Q	F	*	N	E	*	*	*
<i>Callorhynchus milii</i>	E	A	*	K	E	T	K	Q	*	*	K	D	K	F	*	N	V	*	*	*
<i>Cyprinodon variegatus</i>	E	E	*	K	R	Q	N	T	*	*	*	E	K	*	*	N	E	*	*	*
<i>Electrophorus electricus</i>	R	E	*	K	*	E	D	T	R	*	*	E	A	F	*	N	E	*	*	*
<i>Chanos chanos</i>	K	E	*	R	*	E	N	T	H	*	*	Q	E	F	*	N	E	*	*	*
<i>Chiroxiphia lanceolata</i>	*	N	*	E	Q	R	M	*	S	*	E	N	S	F	*	L	N	*	*	*
<i>Anabas testudineus</i>	S	E	*	Q	R	E	*	T	Q	*	*	E	K	F	*	N	E	*	*	*
<i>Scleropages formosus</i>	K	E	*	Q	S	E	N	T	T	*	*	E	S	F	*	N	E	*	*	*
<i>Latimeria chalumnae</i>	*	E	*	K	D	Q	N	Q	E	*	*	N	Q	F	Y	N	K	*	*	*
<i>Oncorhynchus mykiss</i>	R	E	*	*	Q	G	N	T	H	*	*	E	K	F	D	N	E	*	*	*
<i>Oryzias melastigma</i>	*	E	*	K	G	E	Q	T	E	*	*	E	K	*	*	N	E	*	*	*
<i>Eurypyga helias</i>	*	M	*	N	E	S	R	*	N	*	E	N	K	F	K	N	K	*	*	*
<i>Boleophthalmus pectinirostris</i>	R	E	*	K	*	E	Q	S	A	*	N	E	N	F	E	N	K	*	*	*
<i>Gouania willdenowi</i>	R	E	*	Q	R	I	N	S	A	*	*	E	N	F	*	N	E	*	*	*
<i>Haliaeetus leucocephalus</i>	-	M	*	E	E	R	R	*	N	*	E	N	S	F	*	*	N	*	*	*
<i>Tachysurus fulvidraco</i>	R	E	*	K	*	E	D	S	R	*	*	E	A	F	*	N	E	*	*	*
<i>Labrus bergylta</i>	K	E	*	K	R	E	*	S	V	*	N	E	K	*	*	N	E	*	*	*
<i>Cottoperca gobio</i>	R	V	*	Q	*	E	D	S	Q	*	*	E	K	*	K	N	E	*	*	*
<i>Takifugu rubripes</i>	*	Q	*	K	E	E	K	T	E	*	N	E	K	F	*	N	E	*	*	*
<i>Xiphophorus couchianus</i>	E	A	*	E	R	Q	N	S	E	*	K	E	N	*	*	N	E	*	*	*
<i>Astyanax mexicanus</i>	R	D	*	L	*	E	D	S	R	*	*	E	E	F	*	N	E	*	*	*
<i>Lepisosteus oculatus</i>	D	V	*	*	E	K	N	T	H	*	L	E	K	F	E	N	K	*	*	*
<i>Echeneis naucrates</i>	K	E	*	K	R	E	*	T	K	*	N	E	N	*	*	N	E	*	*	*
<i>Paralichthys olivaceus</i>	K	E	*	L	R	Q	*	T	Q	*	N	K	E	F	*	N	E	*	*	*
<i>Xiphophorus maculatus</i>	E	A	*	E	R	Q	N	S	E	*	K	E	N	*	*	N	E	*	*	*
<i>Clupea harengus</i>	R	A	*	E	R	V	K	T	E	*	*	E	T	F	D	N	K	*	*	*
<i>Gadus morhua</i>	R	A	*	E	*	T	*	S	V	*	D	E	A	F	*	N	K	*	*	*

Supporting Figures

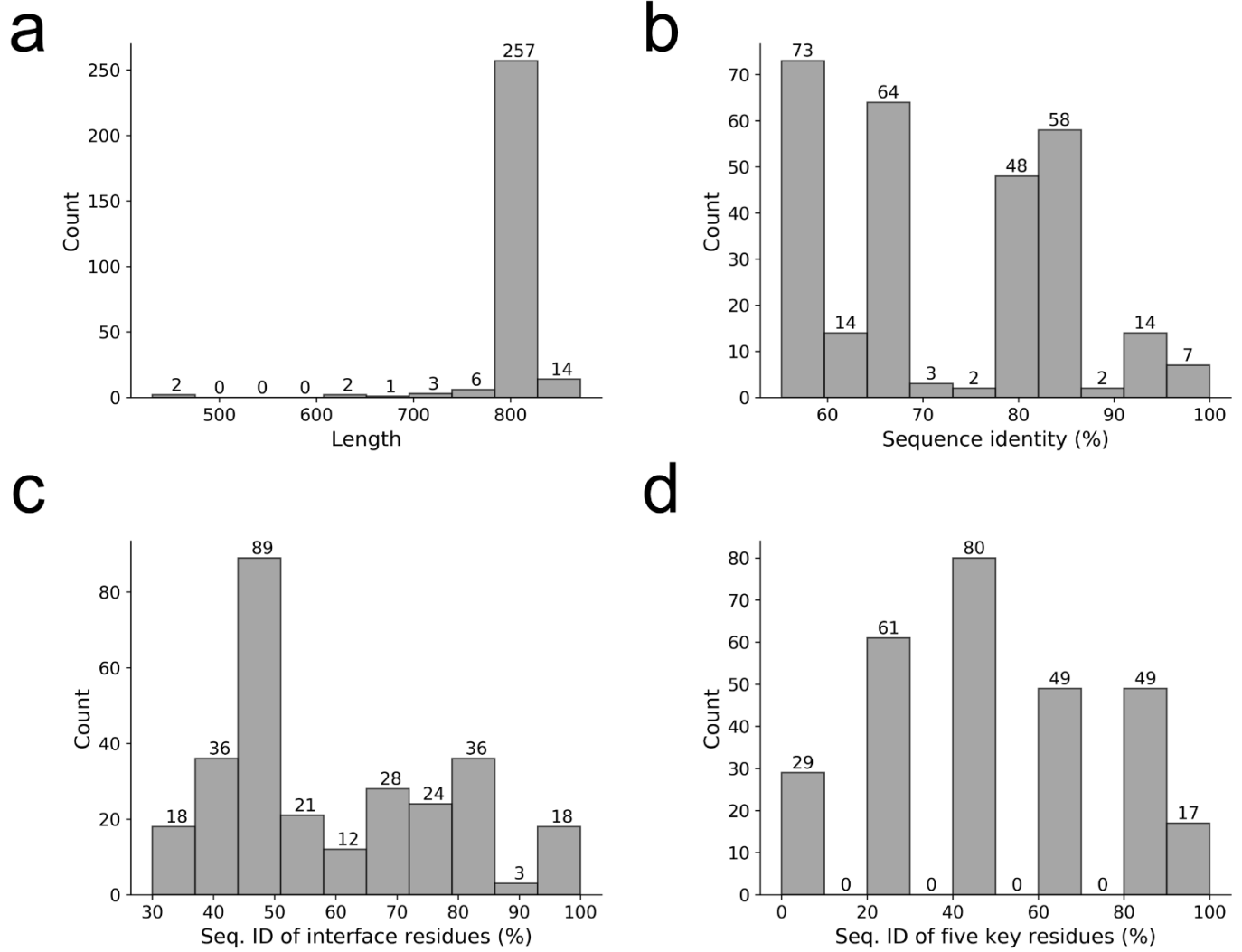


Figure S1. The distribution of protein length, and sequence identity for all, interface, and the five key residues for 285 ACE2 orthologs.

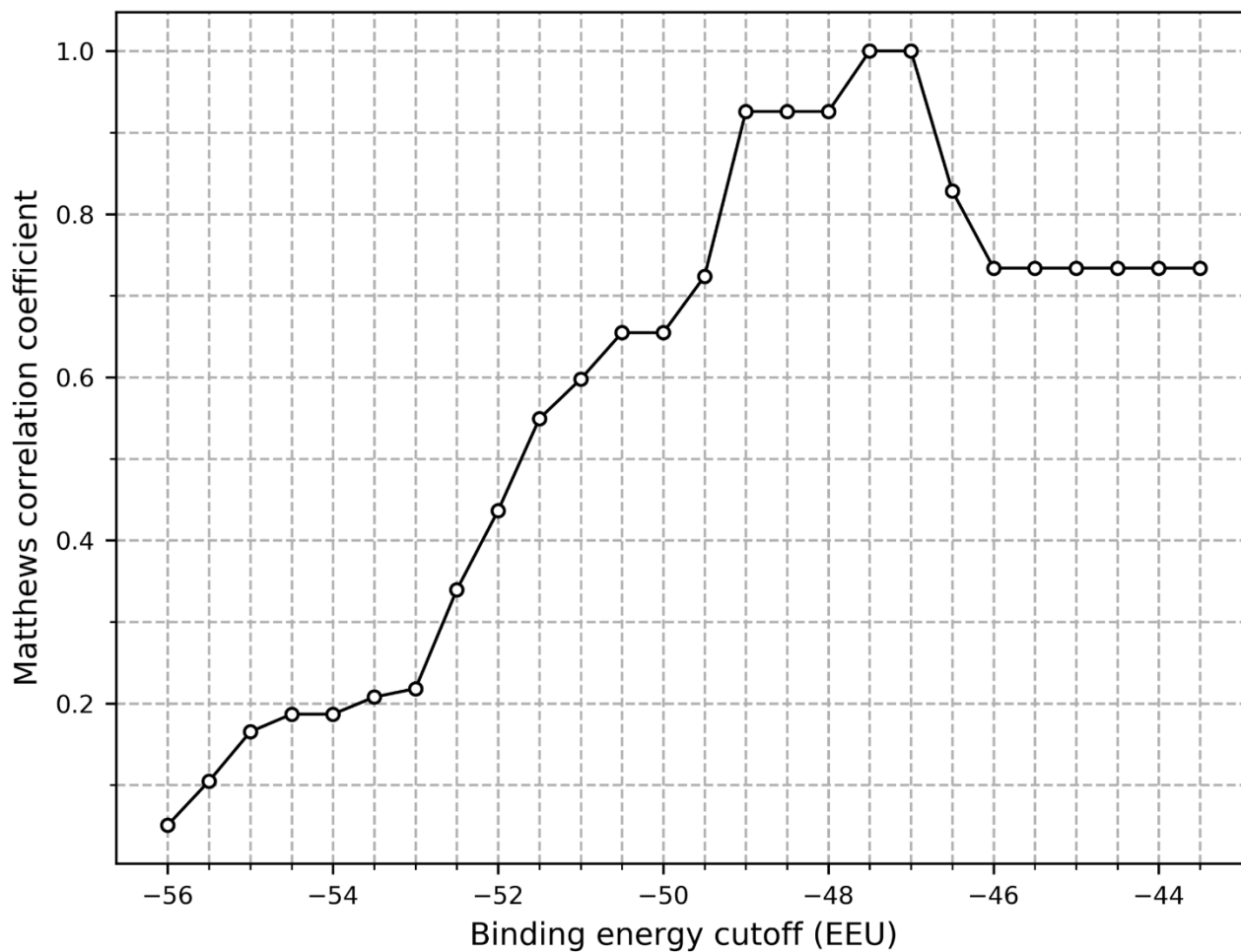


Figure S2. Matthews correlation coefficient for classifying experimentally determined effective ACE2 receptors from the less effective ones by the binding energy calculated from 500 models.

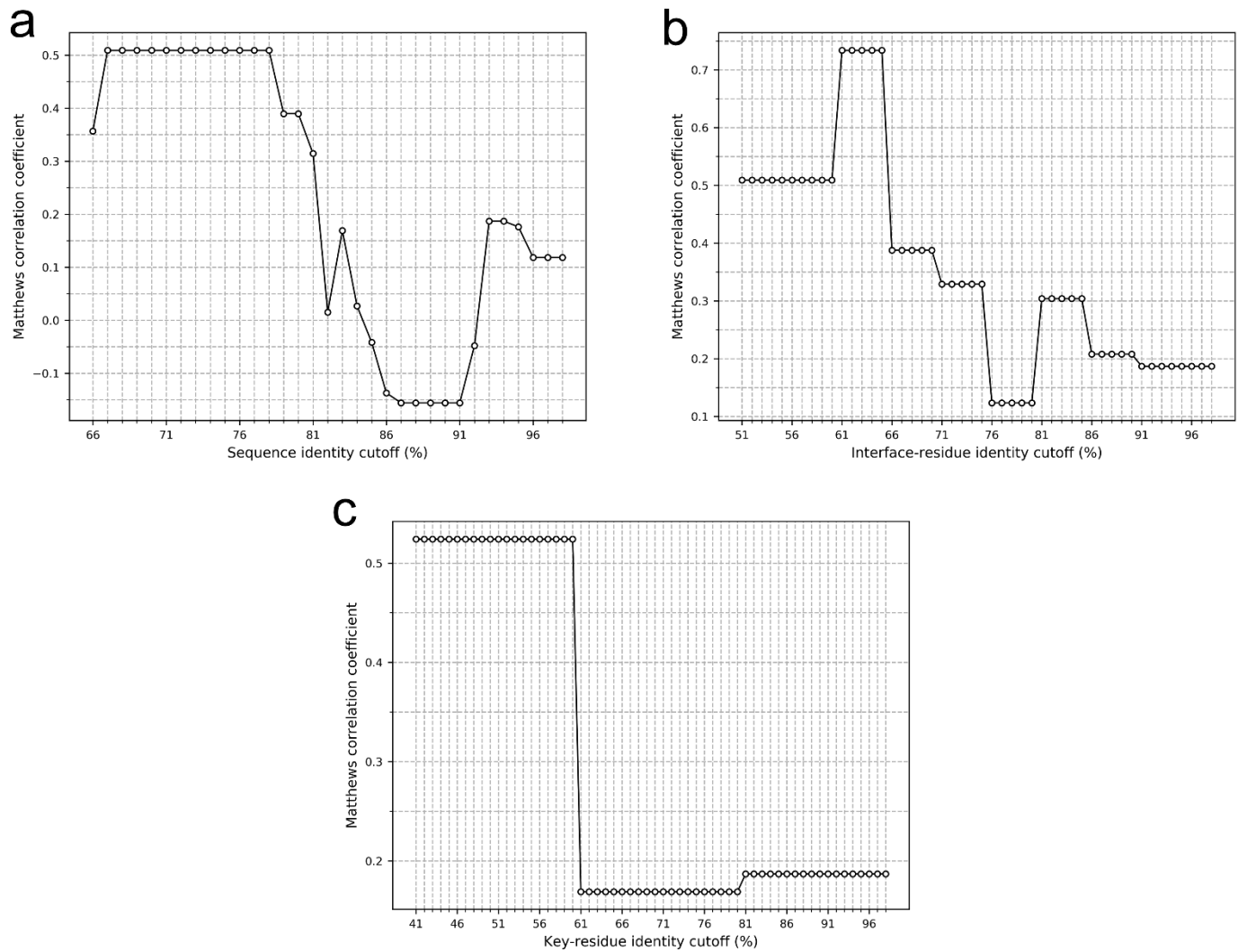


Figure S3. Matthews correlation coefficient for classifying experimentally determined effective ACE2 receptors from the less effective ones by sequence identity in terms of all (a), interface (b), and key (c) residues.

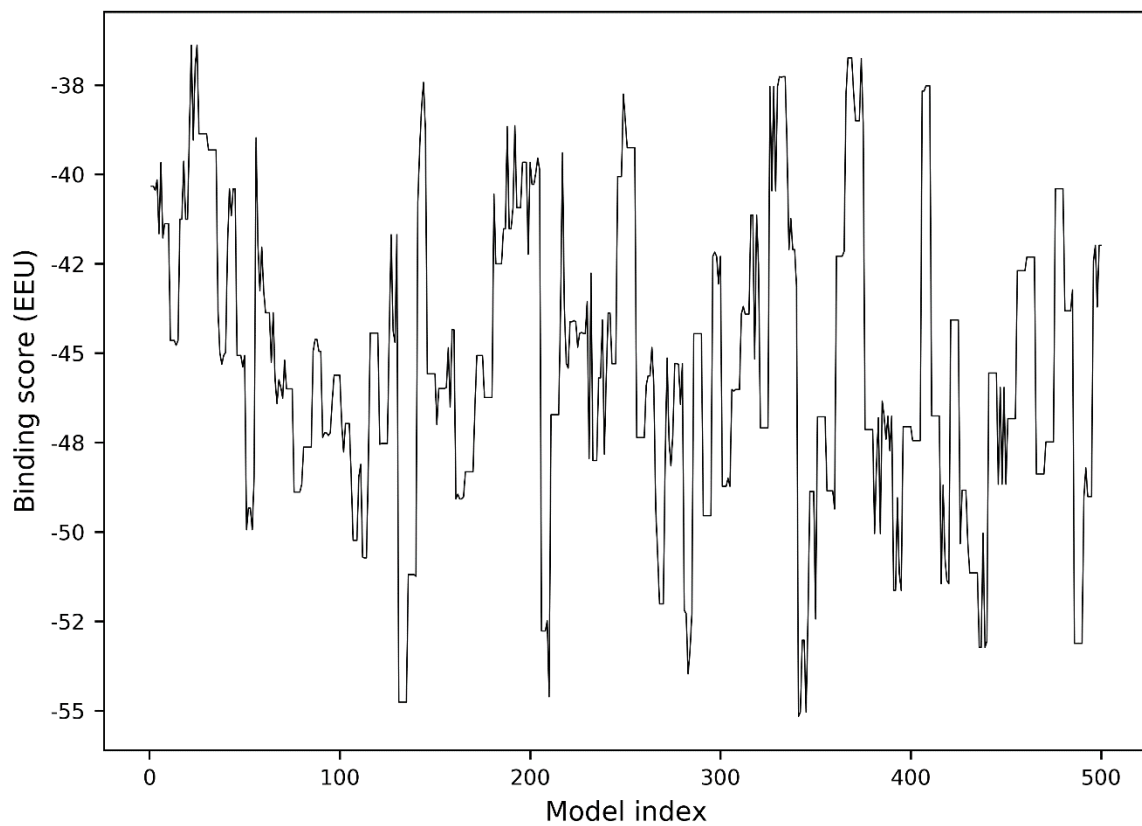


Figure S4. Binding score of 500 models for the hACE2/S-RBD complex.

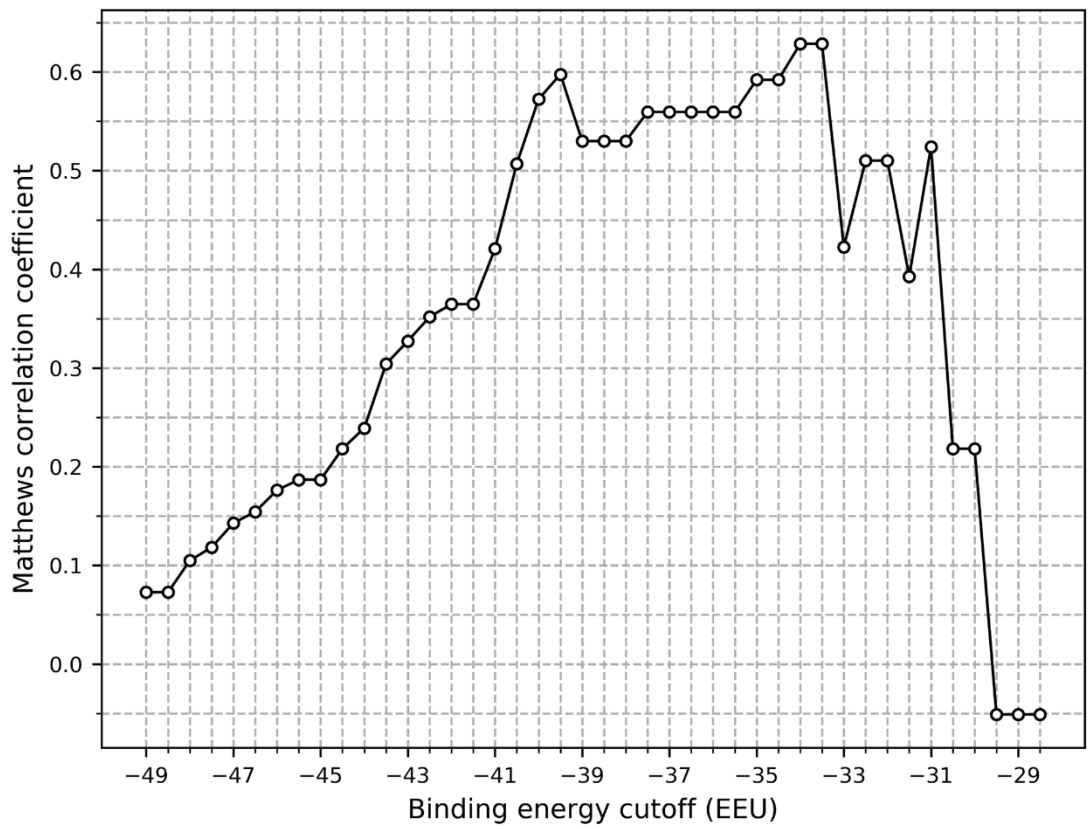


Figure S5. Matthews correlation coefficient for classifying experimentally determined effective ACE2 receptors from the less effective ones by the binding energy calculated from the first model.