Electronic Supplementary Materials for:

**The under-investigated wild side of *Escherichia coli*: genetic diversity, pathogenicity, and antimicrobial resistance in wild animals**

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**Table S1.**

Category assignments for each primary research article included in the literature review and figure 1. References follow the table.

|  |  |  |  |
| --- | --- | --- | --- |
| **First Author\_Publication Year** | **Genetic diversity** | **Antibiotic resistance** | **Pathogenicity** |
| 1. Ahlstrom\_2019a
 | N | Y | N |
| 1. Ahlstrom\_2019b
 | Y | Y | N |
| 1. Ahmed\_2019
 | N | Y | N |
| 1. Allen\_2010
 | N | Y | N |
| 1. Alonso\_2016
 | Y | Y | N |
| 1. Alonso\_2017
 | Y | Y | Y |
| 1. Asai\_2020
 | N | Y | N |
| 1. Asakura\_1998
 | N | Y | Y |
| 1. Blyton\_2015
 | Y | Y | Y |
| 1. Bonnedahl\_2009
 | Y | Y | N |
| 1. Borges\_2017
 | Y | Y | Y |
| 1. Caprioli\_1991
 | N | Y | Y |
| 1. Carroll\_2015
 | Y | Y | N |
| 1. Chiyo\_2014
 | Y | N | N |
| 1. Cole\_2005
 | N | Y | N |
| 1. Costa\_2006
 | N | Y | N |
| 1. Costa\_2008
 | N | Y | N |
| 1. Darwich\_2019
 | N | Y | N |
| 1. Dolejska\_2007
 | N | Y | N |
| 1. Frank\_2019
 | Y | Y | Y |
| 1. Franklin\_2013
 | N | N | Y |
| 1. Fuentes-Castillo\_2019
 | Y | Y | Y |
| 1. Fuentes-Castillo\_2020
 | Y | Y | Y |
| 1. Fulham,\_2018
 | Y | N | N |
| 1. Furness\_2017
 | Y | Y | N |
| 1. Gangiredla\_2017
 | Y | N | Y |
| 1. García-Sánchez\_2007
 | N | N | Y |
| 1. Gilliver\_1999
 | Y | N | Y |
| 1. Goncalves\_2013a
 | N | Y | Y |
| 1. Goncalves\_2013b
 | N | Y | N |
| 1. Gordon\_2003
 | N | Y | N |
| 1. Guenther\_2010a
 | Y | N | N |
| 1. Guenther\_2010b
 | N | Y | N |
| 1. Guenther\_2012
 | Y | Y | N |
| 1. Guyomard-Rabenirina\_2020
 | Y | Y | N |
| 1. Hasan\_2012
 | Y | Y | N |
| 1. Hathcock\_2019
 | N | Y | N |
| 1. Hernandez\_2010
 | Y | Y | N |
| 1. Holko\_2019
 | Y | Y | N |
| 1. Ishibashi\_2019
 | N | Y | N |
| 1. Ishii\_2007
 | Y | N | Y |
| 1. Janatova\_2014
 | Y | Y | N |
| 1. Jardine\_2012
 | Y | Y | N |
| 1. Jay-Russell\_2014
 | N | Y | Y |
| 1. Jobbins\_2015
 | N | Y | N |
| 1. Katakweba\_2014
 | N | Y | N |
| 1. Kobayashi\_2008
 | N | Y | Y |
| 1. Kozak\_2009
 | N | Y | N |
| 1. Literak\_2007
 | N | Y | N |
| 1. Literak\_2010
 | Y | Y | N |
| 1. Livermore\_2001
 | N | Y | N |
| 1. Mercat\_2017
 | Y | Y | N |
| 1. Middleton\_2005
 | N | Y | N |
| 1. Miller\_2019
 | Y | Y | N |
| 1. Mora\_2012
 | Y | N | Y |
| 1. Murphy\_2021
 | Y | Y | Y |
| 1. Navarro-Gonzalez\_2013
 | N | Y | N |
| 1. Ngaiganam\_2019
 | N | Y | N |
| 1. Nhung\_2015
 | N | Y | N |
| 1. Nowak\_2017
 | Y | Y | Y |
| 1. Nowakiewicz\_2020
 | Y | Y | Y |
| 1. Ogawa\_2011
 | N | Y | Y |
| 1. Ong\_2020
 | Y | Y | N |
| 1. Parker\_206
 | N | Y | N |
| 1. Pavlickova\_2017
 | Y | Y | Y |
| 1. Pesapane\_2013
 | Y | Y | N |
| 1. Power\_2016
 | Y | N | Y |
| 1. Radhouani\_2009
 | Y | Y | N |
| 1. Radhouani\_2012
 | Y | Y | N |
| 1. Radhouani\_2013
 | Y | Y | Y |
| 1. Ramey\_2018
 | N | Y | N |
| 1. Ramos\_2019
 | Y | Y | Y |
| 1. Renter\_2001
 | N | N | Y |
| 1. Rolland\_1985
 | N | Y | N |
| 1. Santos\_2013
 | Y | Y | N |
| 1. Schierack\_2009
 | Y | Y | Y |
| 1. Sellera\_2018
 | N | Y | N |
| 1. Sharma\_2017
 | Y | Y | N |
| 1. Shobrak\_2014
 | Y | Y | Y |
| 1. Simões\_2010
 | Y | Y | N |
| 1. Sjölund\_2008
 | Y | Y | N |
| 1. Skurnik\_2006
 | Y | Y | Y |
| 1. Smith\_2014
 | Y | Y | N |
| 1. Sousa\_2011
 | Y | Y | N |
| 1. Souza\_1999
 | Y | Y | Y |
| 1. Stedt\_2014
 | N | Y | N |
| 1. Suenaga\_2019
 | N | Y | N |
| 1. Szczerba-Turek\_2019
 | N | N | Y |
| 1. Szczerba-Turek\_2020
 | N | N | Y |
| 1. Turchi\_2019
 | N | Y | Y |
| 1. VanderWaal\_2014
 | Y | N | N |
| 1. Vredenburg\_2014
 | Y | Y | N |
| 1. Wasyl\_2018
 | N | Y | Y |

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**Table S2.**

Data for figure 2. The literature review encompasses 40 countries and Antarctica.

|  |  |  |
| --- | --- | --- |
| **Location** | **Number of studies** | **Number of wild animal host species studied** |
| Antarctica | 2 | 6 |
| Australia | 4 | 166 |
| Bangladesh | 1 | 2 |
| Botswana | 2 | 18 |
| Brazil | 3 | 10 |
| Canada | 4 | 9 |
| Central African Republic | 1 | 10 |
| Chile | 2 | 7 |
| Czechia | 5 | 16 |
| Denmark | 1 | 2 |
| Egypt | 1 | 7 |
| England | 3 | 5 |
| France | 3 | 23 |
| Gabon | 1 | 8 |
| Germany | 5 | 72 |
| Greenland | 1 | 2 |
| Guadeloupe | 1 | 28 |
| India | 1 | 1 |
| Ireland | 3 | 5 |
| Italy | 3 | 11 |
| Japan | 6 | 74 |
| Kenya | 4 | 3 |
| Latvia | 1 | 1 |
| Mexico | 3 | 52 |
| Mongolia | 1 | 14 |
| Netherlands | 1 | 2 |
| Poland | 5 | 12 |
| Portugal | 11 | 48 |
| Republic of the Congo | 1 | 5 |
| Russia | 2 | 8 |
| Saudi Arabia | 1 | 15 |
| Singapore | 1 | 15 |
| Slovakia | 2 | 6 |
| Spain | 9 | 35 |
| Sweden | 2 | 3 |
| Tanzania | 1 | 3 |
| United States of America | 10 | 36 |
| Venezuela | 1 | 1 |
| Vietnam | 1 | 6 |
| Wales | 1 | 2 |
| Zimbabwe | 1 | 1 |

**Table S3.**

Where wild animal host species-level was provided, table S3 indicates the number of unique studies included in this review in which *E. coli* was isolated from each host species, in descending order.

|  |  |  |
| --- | --- | --- |
| **Common name *(scientific name)*** | **Class** | **Number of studies**  |
| wild boar *(Sus scrofa)* | mammal | 13 |
| roe deer *(Capreolus capreolus)* | mammal | 12 |
| red deer *(Cervus elaphus)* | mammal | 11 |
| house mouse *(Mus musculus)* | mammal | 9 |
| black rat *(Rattus rattus)* | mammal | 7 |
| herring gull *(Larus argentatus)* | bird | 7 |
| European rabbit *(Oryctolagus cuniculus)* | mammal | 6 |
| mouflon *(Ovis musimon)* | mammal | 6 |
| red fox *(Vulpes vulpes)* | mammal | 6 |
| rock pigeon *(Columba livia)* | bird | 6 |
| wood mouse *(Apodemus sylvaticus)* | mammal | 6 |
| yellow-legged gull *(Larus michahellis)* | bird | 6 |
| black-headed gull (Larus ridibundus) | bird | 5 |
| brown rat *(Rattus norvegicus)* | mammal | 5 |
| Eurasian blackbird *(Turdus merula)* | bird | 5 |
| Eurasian buzzard *(Buteo buteo)* | bird | 5 |
| glaucous gull *(Larus hyperboreus)* | bird | 5 |
| African buffalo *(Syncerus caffer)* | mammal | 4 |
| bank vole *(Myodes glareolus)* | mammal | 4 |
| barn owl *(Tyto alba)* | bird | 4 |
| Canada goose *(Branta canadensis)* | bird | 4 |
| European badger *(Meles meles)* | mammal | 4 |
| European starling *(Sturnus vulgaris)* | bird | 4 |
| glaucous-winged gull *(Larus glaucescens)* | bird | 4 |
| lesser black-back gull *(Larus fuscus)* | bird | 4 |
| cattle egret *(Bubulcus ibis)* | bird | 3 |
| common vole *(Microtus arvalis)* | mammal | 3 |
| Eurasian magpie *(Pica pica)* | bird | 3 |
| Eurasian sparrowhawk *(Accipiter nisus)* | bird | 3 |
| fallow deer *(Dama dama)* | mammal | 3 |
| golden eagle *(Aquila chrysaetos)* | bird | 3 |
| grey heron *(Ardea cinerea)* | bird | 3 |
| mallard duck *(Anas platyrhynchos)* | bird | 3 |
| Northern goshawk *(Accipiter gentilis)* | bird | 3 |
| short-beaked echidna *(Tachyglossus aculeatus)* | mammal | 3 |
| white-tailed deer *(Odocoileus virginianus)* | mammal | 3 |
| African bush elephant *(Loxodonta africana)* | mammal | 2 |
| alpine marmot *(Marmota marmota)* | mammal | 2 |
| Australian swamp rat *(Rattus lutreolus)* | mammal | 2 |
| banded mongoose *(Mungos mungo)* | mammal | 2 |
| barn swallow *(Hirundo rustica)* | bird | 2 |
| Beech marten *(Martes foina)* | mammal | 2 |
| black kite *(Milvus migrans)* | bird | 2 |
| brown bear *(Ursus arctos)* | mammal | 2 |
| bush rat *(Rattus fuscipes)* | mammal | 2 |
| Chaffinch *(Fringilla coelebs)* | bird | 2 |
| cinereous vulture *(Aegypius monachus)* |  bird | 2 |
| common brushtail possum *(Trichosurus vulpecula)* | mammal | 2 |
| common kestrel *(Falco tinnunculus)* | bird | 2 |
| common kingfisher *(Alcedo atthis)* | bird | 2 |
| common pheasant *(Phasianus colchicus)* | bird | 2 |
| common raccoon *(Procyon lotor)* | mammal | 2 |
| common rock rat *(Zyzomys argurus)* | mammal | 2 |
| common teal *(Anas crecca)* | bird | 2 |
| coyote *(Canis latrans)* | mammal | 2 |
| deer mouse *(Peromyscus maniculatus)* | mammal | 2 |
| dusky antechinus *(Antechinus swainsonii)* | mammal | 2 |
| Eastern grey kangaroo *(Macropus giganteus)* | mammal | 2 |
| emperor goose *(Chen canagica)* | bird | 2 |
| Eurasian blackcap *(Sylvia atricapilla)* | bird | 2 |
| Eurasian coot *(Fulica atra)* | bird | 2 |
| Eurasian eagle-owl *(Bubo bubo)* | bird | 2 |
| Eurasian tree sparrow *(Passer montanus)* | bird | 2 |
| European collared dove *(Streptopelia decaocto)* | bird | 2 |
| European goldfinch *(Carduelis carduelis)* | bird | 2 |
| European greenfinch *(Carduelis chloris)* | bird | 2 |
| European hare *(Lepus europeus)* | mammal | 2 |
| European hedgehog *(Erinaceus europeus)* | mammal | 2 |
| European pine vole *(Microtus subterraneus)* | mammal | 2 |
| European robin *(Erithacus rubecula)* | bird | 2 |
| European serin *(Serinus serinus)* | bird | 2 |
| European water vole *(Arvicola amphibius)* | mammal | 2 |
| field vole *(Microtus agrestis)* | mammal | 2 |
| galah *(Cacatua roseicapilla)* | bird | 2 |
| giraffe *(Giraffa camelopardalis)* | mammal | 2 |
| gray wolf *(Canis lupus)* | mammal | 2 |
| great cormorant *(Phalacrocorax carbo)* | bird | 2 |
| great tit *(Parus major)* | bird | 2 |
| great-horned owl *(Bubo virginianus)* | bird | 2 |
| greater white-fronted goose *(Anser albifrons)* | bird | 2 |
| house sparrow *(Passer domesticus)* | bird | 2 |
| impala *(Aepyceros melampus)* | mammal | 2 |
| Isabelline shrike *(Lanius isabellinus)* | bird | 2 |
| koala *(Phascolarctos cinereus)* | mammal | 2 |
| laughing dove *(Spilopelia senegalensis)* | bird | 2 |
| lesser long-eared bat *(Nyctophilus geoffroyi)* | mammal | 2 |
| long-nosed bandicoot *(Perameles nasuta)* | mammal | 2 |
| Magellanic horned-owl *(Bubo magellanicus)* | bird | 2 |
| Mallee Australian ringneck *(Barnardius zonanius)* | bird | 2 |
| meadow vole *(Microtus pennsylvanicus)* | mammal | 2 |
| Mediterranean turtle *(Mauremys leprosa)* | reptile | 2 |
| Mitchell’s hopping mouse *(Notomys mitchellii)* | mammal | 2 |
| mute swan *(Cygnus olor)* | bird | 2 |
| Northern quoll *(Dasyurus hallucatus)* | mammal | 2 |
| pine marten *(Martes martes)* | mammal | 2 |
| Rüppell’s weaver *(Ploceus galbula)* | bird | 2 |
| Russian rook *(Corvus frugilegus)* | bird | 2 |
| short-tailed shearwater *(Puffinus tenuirostris)* | bird | 2 |
| short-tailed shrew *(Blarina brevicauda)* | mammal | 2 |
| silver gull *(Larus/Chroicocephalus novaehollandiae)* | bird | 2 |
| striped field mouse *(Apodemus agrarius)* | mammal | 2 |
| Tammar wallaby *(Macropus eugenii)* | mammal | 2 |
| tawny owl *(Strix aluco)* | bird | 2 |
| tiger quoll *(Dasyurus maculatus)* | mammal | 2 |
| tufted duck *(Aythya fuligula)* | bird | 2 |
| Western quoll *(Dasyurus geoffroii)* | mammal | 2 |
| Western sandpiper *(Calidris mauri)* | bird | 2 |
| white-footed mouse *(Peromyscus leucopus)* | mammal | 2 |
| wild goat *(Capra hircus)* | mammal | 2 |
| winter wren *(Troglodytes hiemalis)* | bird | 2 |
| Woylie *(Bettongia penicillata)* | mammal | 2 |
| yellow baboon *(Papio cynocephalus)* | mammal | 2 |
| yellow-footed antechinus *(Antechinus flavipes)* | mammal | 2 |
| yellow-necked mouse *(Apodemus flavicollis)* | mammal | 2 |
| Adelie penguins *(Pygoscelis adeliae)* | bird | 1 |
| agile mangabey *(Cercocebus agilis)* | mammal | 1 |
| Algerian hedgehog *(Aetechinus algirus)* | mammal | 1 |
| Amami rabbit *(Pentalagus furnessi)* | mammal | 1 |
| American black vulture *(Coragyps atratus)* | bird | 1 |
| America robin *(Turdus migratorius)* | bird | 1 |
| American crow *(Corvus brachyrhynchos)* | bird | 1 |
| American kestrel *(Falco sparverius)* | bird | 1 |
| American mink *(Mustela vison)* | mammal | 1 |
| American redstart *(Setophaga ruticilla)* | bird | 1 |
| Andean condors *(Vultur gryphus)* | bird | 1 |
| Antarctic soft-shelled clam *(Laternula elliptica)* | bivalve | 1 |
| Arabian babbler *(Turdoides squamiceps)* | bird | 1 |
| Arabian serin *(Crithagra rothschildi)* | bird | 1 |
| Asian house martin *(Delichon urbica dasypus)* | bird | 1 |
| Asian house shrew *(Suncus murinus)* | mammal | 1 |
| Atlantic bonito *(Sarda sarda)* | fish | 1 |
| Atlantic canary *(Serinus canaria)* | bird | 1 |
| Atlantic croaker *(Micropogonias undulatus)* | fish | 1 |
| Atlantic spadefish *(Chaetodipterus faber)* | fish | 1 |
| Austral pygmy owl *(Glaucidium nana)* | bird | 1 |
| Australian brush-turkey *(Alectura lathami)* | bird | 1 |
| Australian magpie *(Gymnorhina tibicen)* | bird | 1 |
| Australian raven *(Corvus coronoides)* | bird | 1 |
| Australian sea lion *(Neophoca cinerea)* | mammal | 1 |
| Australian white ibis *(Threskiornis molucca)* | bird | 1 |
| Australian wood duck *(Chenonetta jubata)* | bird | 1 |
| azure-winged magpie *(Cyanopica cyana)* | bird | 1 |
| Baird’s tapir *(Tapirus bairdii)* | mammal | 1 |
| bald eagle *(Haliaeetus leucocephalus)* | bird | 1 |
| Bananaquit *(Coereba flaveola)* | bird | 1 |
| bar-shouldered dove *(Geopelia humeralis)* | bird | 1 |
| barbary dove *(Streptopelia risoria)* | bird | 1 |
| barred owl *(Strix varia)* | bird | 1 |
| berylline hummingbird *(Amazilia beryllina)* | bird | 1 |
| black bittern *(Ixobrychus flavicollis)* | bird | 1 |
| black and white warbler *(Mniotilta varia)* | bird | 1 |
| black crowned night heron *(Nycticorax nycticorax)* | bird | 1 |
| black-naped oriole *(Oriolus chinensis)* | bird | 1 |
| black scoter *(Melanitta nigra)* | bird | 1 |
| black scrub robin *(Cercotrichas podobe)* | bird | 1 |
| black swan *(Cygnus atratus)* | bird | 1 |
| black-faced bunting *(Emberiza spodocephala)* | bird | 1 |
| black-faced cuckoo *(Coracina novaehollandiae)* | bird | 1 |
| black-faced grassquit *(Tiaris bicolor)* | bird | 1 |
| black-flanked rock-wallaby *(Petrogale lateralis)* | mammal | 1 |
| black-handed spider monkey *(Ateles geoffroyi)* | mammal | 1 |
| black-legged kittiwakes *(Rissa tridactyla)* | bird | 1 |
| black-tailed gull *(Larus crassirostris)* | bird | 1 |
| black-whiskered vireo *(Vireo altiloquus)* | bird | 1 |
| blackpoll warbler *(Dendroica striata)* | bird | 1 |
| brahminy kite *(Haliastur indus)* | bird | 1 |
| blue duiker *(Philantomba monticola)* | mammal | 1 |
| blue tit *(Cyanistes caeruleus)* | bird | 1 |
| blue-and-white flycatcher *(Cyanoptila cyanomelana)* | bird | 1 |
| blue-billed duck *(Oxyura australis)* | bird | 1 |
| blue-faced honeyeater *(Entomyzon cyanotis)* | bird | 1 |
| blue-footed booby *(Sula nebouxii)* | bird | 1 |
| Bolson tortoise *(Gopherus flavomarginatus)* | reptile | 1 |
| Bonelli’s eagle *(Hieraaetus fasciatus)* | bird | 1 |
| boobook owl *(Ninox novaeseelandiae)* | bird | 1 |
| booted eagle *(Hieraaetus pennatus)* | bird | 1 |
| Brambling *(Fringilla montifringilla)* | bird | 1 |
| Brazilian mojarra *(Eugerres brasilianus)* | fish | 1 |
| Brent goose *(Branta bernicla)* | bird | 1 |
| bridled nail-tail wallaby *(Onychogalea fraenata)* | mammal | 1 |
| bridled quail dove *(Geotrygon mystacea)* | bird | 1 |
| broad-toothed mouse *(Mastacomys fuscus)* | mammal | 1 |
| broad-winged hawk *(Buteo platypterus)* |  bird | 1 |
| brown antechinus *(Antechinus stuartii)* | mammal | 1 |
| brown deer mouse *(Peromyscus megalops)* | mammal | 1 |
| brown falcon *(Falco berigora)* | bird | 1 |
| brown goshawk *(Accipiter fasciatus)* | bird | 1 |
| brown hawk owl *(Ninox scutulata japonica)* | bird | 1 |
| brown Long-eared bat *(Plecotus auritus)* | mammal | 1 |
| brown thornbill *(Acanthiza pusilla)* | bird | 1 |
| brown treecreeper *(Climacteris picumnus)* | bird | 1 |
| brown-eared bulbul *(Ixos amaurotis)* | bird | 1 |
| brush mouse *(Peromyscus boylii)* | mammal | 1 |
| buff-banded rail *(Gallinula philippensis)* | bird | 1 |
| Cape bushbuck *(Tragelaphus sylvaticus)* | mammal | 1 |
| Cape hare *(Lepus capensis)* | mammal | 1 |
| capercaillie *(Tetrao urogallus)* | bird | 1 |
| capybara *(Hydrochaeris hydrochaeris)* | mammal | 1 |
| Carib grackle *(Quiscalus lugubris)* | bird | 1 |
| Caribbean Elaenia *(Elaenia martinica)* | bird | 1 |
| carrion crow *(Corvus corone orientalis)* | bird | 1 |
| chacma baboon *(Papio ursinus)* | mammal | 1 |
| chamois *(Rupicapra rupicapra)* | mammal | 1 |
| chestnut-capped brushfinch *(Atlapetes brunneinucha)* | bird | 1 |
| chestnut-rumped heathwren *(Hylacola pyrrhopygia)* | bird | 1 |
| Chiffchaff *(Phylloscopus collybita)* | bird | 1 |
| Chimango caracara *(Milvago chimango)* | bird | 1 |
| chimpanzee *(Pan troglodytes)* | mammal | 1 |
| chocolate wattled bat *(Chalinolobus morio)* | mammal | 1 |
| chough *(Pyrrhocorax pyrrhocorax)* | bird | 1 |
| coal tit *(Parus ater)* | bird | 1 |
| collared peccary *(Tayassu tajacu)* | mammal | 1 |
| collared sparrowhawk *(Accipiter cirrocephalus)* | bird | 1 |
| common Azores quail *(Coturnix coturnix conturbans)* | bird | 1 |
| common bottlenose dolphin *(Tursiops truncates)* | mammal | 1 |
| common bronzewing *(Phaps chalcoptera)* | bird | 1 |
| common eider *(Somateria mollissima)* | bird | 1 |
| common eland *(Taurotragus oryx)* | mammal | 1 |
| common ground dove *(Columbina passerina)* | bird | 1 |
| common moorhen *(Gallinula chloropus)* | bird | 1 |
| common pipistrelle *(Pipistrellus pipistrellus)* | mammal | 1 |
| common pochard *(Aythya ferina)* | bird | 1 |
| common redstart *(Phoenicurus phoenicurus)* | bird | 1 |
| common ringtail possum *(Pseudocheirus peregrinus)* | mammal | 1 |
| common shrew *(Sorex araneus)* | mammal | 1 |
| common snipe *(Gallinago gallinago)* | bird | 1 |
| common snook *(Centropomus undecimalis)* | fish | 1 |
| common swift *(Apus apus)* | bird | 1 |
| common treecreeper *(Certhia familiaris)* | bird | 1 |
| common vampire bat *(Desmodus rotundus)* | mammal | 1 |
| common wallaroo *(Macropus robustus)* | mammal | 1 |
| common whitethroat *(Sylvia communis)* | bird | 1 |
| Cooper's hawk *(Accipiter cooperii)* | bird | 1 |
| cormorant *(Phalacrocorax fuscescens)* | bird | 1 |
| Cotte duck (scientific name unknown) | bird | 1 |
| cougar *(Felis concolor)* | mammal | 1 |
| country mouse *(Pseudomys patrius)* | mammal | 1 |
| crest-tailed mulgara *(Dasycercus cristicauda)* | mammal | 1 |
| crested goshawk *(Accipiter trivirgatus)* | bird | 1 |
| crested pigeon *(Ocyphaps lophotes)* | bird | 1 |
| crimson rosella *(Platycercus elegans)* | bird | 1 |
| Daubenton‘s bat *(Myotis daubentonii)* | mammal | 1 |
| Demoiselle crane *(Anthropoides virgo)* | bird | 1 |
| desert mouse *(Pseudomys desertor)* | mammal | 1 |
| desert pocket mouse *(Perognathus penicillatus)* | mammal | 1 |
| double-barred finch *(Taeniopygia bichenovii)* | bird | 1 |
| dunlin *(Calidris alpina)* | bird | 1 |
| Dunnock *(Prunella modularis)* | bird | 1 |
| dusky moorhen *(Gallinula tenebrosa)* | bird | 1 |
| dusky thrush *(Turdus naumanni)* | bird | 1 |
| eared dove *(Zenaida auriculata)* | bird | 1 |
| Eastern quoll *(Dasyurus viverrinus)* | mammal | 1 |
| Eastern rosella *(Platycercus eximius)* | bird | 1 |
| Eastern screech owl *(Megascops asio)* | bird | 1 |
| Eastern spinebill *(Acanthorhynchus tenuirostris)* | bird | 1 |
| Eastern yellow robin *(Eopsaltria australis)* | bird | 1 |
| Egyptian fruit bat *(Rousettus aegyptiacus)* | mammal | 1 |
| Egyptian goose *(Alopochen aegyptiacus)* | bird | 1 |
| Egyptian vulture *(Neophron percnopterus)* | bird | 1 |
| emperor penguin *(Aptenodytes forsteri)* | bird | 1 |
| emu *(Dromaius novaehollandiae)* | bird | 1 |
| Eurasian hobby *(Falco subbuteo)* | bird | 1 |
| Eurasian hoopoe *(Upupa epops)* | bird | 1 |
| Eurasian jay *(Garrulus glandarius)* | bird | 1 |
| Eurasian nuthatch *(Sitta europaea)* | bird | 1 |
| Eurasian otter *(Lutra lutra)* | mammal | 1 |
| Eurasian pygmy shrew *(Sorex minutus)* | mammal | 1 |
| Eurasian siskin *(Carduelis spinus)* | bird | 1 |
| Eurasian wigeon *(Anas pelope)* | bird | 1 |
| Eurasian wood cock *(Scolopax rusticola)* | bird | 1 |
| Eurasian wren *(Troglodytes troglodytes)* | bird | 1 |
| European bison *(Bison bonasus)* | mammal | 1 |
| European mink *(Mustela lutreola)* | mammal | 1 |
| fan-tailed cuckoo *(Cuculus flabelliformis)* | bird | 1 |
| fawn antechinus *(Antechinus bellus)* | mammal | 1 |
| firecrest *(Regulus ignicapillus)* | bird | 1 |
| Florida pompano *(Trachinotus carolinus)* | fish | 1 |
| forest elephant *(Loxodonta cyclotis)* | mammal | 1 |
| forest thrush *(Turdus lherminieri)* | bird | 1 |
| Franquet’s epauletted fruit bat *(Epomops franqueti)* | mammal | 1 |
| fuscous honeyeater *(Lichenostomus fuscus)* | bird | 1 |
| gadwall *(Anas strepera)* | bird | 1 |
| garden warbler *(Sylvia borin)* | bird | 1 |
| gemsbok *(Oryx gazella)* | mammal | 1 |
| genet *(Genetta genetta)* | mammal | 1 |
| gilthead seabream *(Sparus aurata)* | fish | 1 |
| golden pheasant *(Chryslophus pictus)* | bird | 1 |
| golden-browed warbler *(Basileuterus belli)* | bird | 1 |
| golden-mantled howling monkey *(Alouatta palliata)* | mammal | 1 |
| gorilla *(Gorilla gorilla)* | mammal | 1 |
| Gould’s wattled bat *(Chalinolobus gouldii)* | mammal | 1 |
| grasshopper warbler *(Locustella naevia)* | bird | 1 |
| gray four-eyed opossum *(Philander opossum)* | mammal | 1 |
| gray fox *(Urocyon cinereoargenteus)* | mammal | 1 |
| gray-breasted wood wren *(Henicorhina leucophrys)* | bird | 1 |
| grayish mouse opossum *(Marmosa canescens)* | mammal | 1 |
| great egret *(Egretta alba)* | bird | 1 |
| great spotted woodpecker *(Dendrocopos major)* | bird | 1 |
| greater bandicoot rat *(Bandicota indica)* | mammal | 1 |
| greater crested tern *(Thalasseus bergii)* | bird | 1 |
| greater kudu *(Tragelaphus strepsiceros)* | mammal | 1 |
| greater scaup *(Aythya marila)* | bird | 1 |
| greater white-toothed shrew *(Crocidura russula)* | mammal | 1 |
| green figbird *(Sphecotheres viridis)* | bird | 1 |
| green heron *(Butorides virescens)* | bird | 1 |
| green iguana *(Iguana iguana)* | reptile | 1 |
| green woodpecker *(Picus viridis)* | bird | 1 |
| green-winged teal duck *(Anas carolinensis)* | bird | 1 |
| grey butcherbird *(Cracticus torquatus)* | bird | 1 |
| grey fantail *(Rhipidura fuliginosa)* | bird | 1 |
| grey wagtail *(Motacilla cinerea)* | bird | 1 |
| grey-capped green finch *(Carduelis sinica)* | bird | 1 |
| Guatemalan black howler *(Alouatta pigra)* | mammal | 1 |
| gyrfalcon *(Falco rusticolus)* | bird | 1 |
| hammer-headed bat *(Hypsignathus monstrosus)* | mammal | 1 |
| harvest mouse *(Micromys minutus)* | mammal | 1 |
| heart urchin *(Abatus nimrodi)* | echinoid | 1 |
| hippopotamus *(Hippopotamus amphibius)* | mammal | 1 |
| hoary-headed grebe *(Poliocephalus poliocephalus)* | bird | 1 |
| Honsyu ural owl *(Strix uralensis hondoensis)* | bird | 1 |
| hooded crane *(Grus monacha)* | bird | 1 |
| hooded crow *(Corvus cornix)* | bird | 1 |
| hooded pitta *(Pitta sordida)* | bird | 1 |
| Horsfield’s bronze cuckoo *(Chrysococcyx basalis)* | bird | 1 |
| Iberian ibex *(Capra pyrenaica)* | mammal | 1 |
| Iberian lynx *(Lynx pardinus)* | mammal | 1 |
| Iberian wolf *(Canis lupus signatus)* | mammal | 1 |
| Iceland gull *(Larus glaucoides)* | bird | 1 |
| intermediate egret *(Ardea intermedia)* | bird | 1 |
| jackdaw *(Corvus monedula)* | bird | 1 |
| jacky winter *(Microeca fascinans)* | bird | 1 |
| jaguar *(Panthera onca)* | mammal | 1 |
| Jaliscan cotton rat *(Sigmodon mascotensis)* | mammal | 1 |
| Japanese badger *(Meles anakuma)* | mammal | 1 |
| Japanese macaques *(Macaca fuscata)* | mammal | 1 |
| Japanese robin *(Erithacus akahige)* | bird | 1 |
| Japanese scops owl *(Otus lempiji semitorques)* | bird | 1 |
| Japanese shrew mole *(Urotrichus talpoides)* | mammal | 1 |
| Japanese sky lark *(Alauda arvensis japonica)* | bird | 1 |
| Japanese white-eye *(Zosterops japonicus)* | bird | 1 |
| kelp gull *(Larus dominicanus)* | bird | 1 |
| Kentish plover *(Charadrius alexandrinus)* | bird | 1 |
| Lappet-faced vulture *(Torgos tracheliotos)* | bird | 1 |
| large forest bat *(Vespadelus darlingtonia)* | mammal | 1 |
| large Japanese field mouse *(Apodemus speciosus)* | mammal | 1 |
| large-billed crow *(Corvus macrorhyncos)* | bird | 1 |
| laughing kookaburra *(Dacelo novaeguineae)* | bird | 1 |
| leopard *(Panthera pardus)* | mammal | 1 |
| leopard anole *(Anolis marmoratus)* | reptile | 1 |
| Les Saines anole *(Anolis terraealtae)* | reptile | 1 |
| Lesser Antilean iguana *(Iguana delicatissima)* | reptile | 1 |
| Lesser Antillean bullfinch *(Loxigilla noctis)* | bird | 1 |
| Lesser Antillean Saltator *(Saltator albicollis)* | bird | 1 |
| Lesser kestrel *(Falco naumanni)* | bird | 1 |
| Lesser white-toothed shrew *(Crocidura suaveolens)* | mammal | 1 |
| little collared fruit bat *(Myonycteris torquata)* | mammal | 1 |
| little corella *(Cacatua sanguinea)* | bird | 1 |
| little egret *(Egretta garzetta)* | bird | 1 |
| little forest bat *(Vespadelus vulturnus)* | mammal | 1 |
| little friarbird *(Philemon citreogularis)* | bird | 1 |
| little long-tailed dunnart *(Sminthopsis dolichura)* | mammal | 1 |
| little wattlebird *(Anthochaera chrysoptera)* | bird | 1 |
| long-billed corella *(Cacatua tenuirostris)* | bird | 1 |
| long-eared owl *(Asio otus)* | bird | 1 |
| long-nosed potoroo *(Potorous tridactylus)* | mammal | 1 |
| long-tailed duck *(Clangula hyemalis)* | bird | 1 |
| long-tailed tit *(Aegithalos caudatus)* | bird | 1 |
| lowland bongo *(Tragelaphus eurycerus eurycerus)* | mammal | 1 |
| lucifer sheartail *(Calothorax lucifer)* | bird | 1 |
| magpie-lark *(Grallina cyanoleuca)* | bird | 1 |
| mahogany glider *(Petaurus gracilis)* | mammal | 1 |
| marine catfish *(Genidens genidens)* | fish | 1 |
| marsh warbler *(Acrocephalus palustris)* | bird | 1 |
| masked lapwing *(Vanellus miles)* | bird | 1 |
| meadow bunting *(Emberiza cioides)* | bird | 1 |
| Merriam’s kangaroo rat *(Dipodomys merriami)* | mammal | 1 |
| Mexican free-tailed bat *(Tadarida brasiliensis)* | mammal | 1 |
| Mexican long-nosed bat *(Leptonycteris nivalis)* | mammal | 1 |
| Morne Constant anole *(Anolis ferreus)* | reptile | 1 |
| mountain pygmy possum *(Burramys parvus)* | mammal | 1 |
| mule deer *(Odocoileus hemionus)* | mammal | 1 |
| musk lorikeet *(Glossopsitta concinna)* | bird | 1 |
| Nankeen kestrel *(Falco cenchroides)* | bird | 1 |
| Nankeen night heron *(Nycticorax caledonicus)* | bird | 1 |
| Nathusius’s pipistrelle *(Pipistrellus nathusii)* | mammal | 1 |
| Natterer's bat *(Myotis nattereri)* | mammal | 1 |
| neotropical otter *(Lutra longicaudis)* | mammal | 1 |
| New Holland honeyeater *(Phylidonyris novaehollandiae)* | bird | 1 |
| nightjar *(Caprimulgus europaeus)* | bird | 1 |
| noisy friarbird *(Philemon corniculatus)* | bird | 1 |
| noisy miner *(Manorina melanocephala)* | bird | 1 |
| Northern hairy-nosed wombat *(Lasiorhinus krefftii)* | mammal | 1 |
| Northern waterthrush *(Parkesia noveboracensis)* | bird | 1 |
| nutria *(Myocastor coypus)* | mammal | 1 |
| Okinawa rail *(Gallirallus okinawae)* | bird | 1 |
| orange-footed parakeet *(Aratinga canicularis)* | bird | 1 |
| Oriental cuckoo *(Cuculus saturatus horsfieldi)* | bird | 1 |
| Oriental turtle dove *(Streptopelia orientalis)* | bird | 1 |
| osprey *(Pandion haliaetus)* | bird | 1 |
| Pacific black duck *(Anas superciliosa)* | bird | 1 |
| Pacific gull *(Larus pacificus)* | bird | 1 |
| painted spiny pocket mouse *(Liomys pictus)* | mammal | 1 |
| pale-yellow robin *(Tregellasia capito)* | bird | 1 |
| peach-faced lovebird *(Agapornis roseicollis)* | bird | 1 |
| pearly-eyed thrasher *(Margarops fuscatus)* | bird | 1 |
| Peregrine falcon *(Falco peregrinus)* | bird | 1 |
| Peter's duiker *(Cephalophus callipygus)* | mammal | 1 |
| pheasant coucal *(Centropus phasianinus)* | bird | 1 |
| Philby’s partridge *(Alectoris philbyi)* | bird | 1 |
| pied currawong *(Strepera graculina)* | bird | 1 |
| pied fantail *(Rhipidura javanica)* | bird | 1 |
| platypus *(Ornithorhynchus anatinus)* | mammal | 1 |
| plumbeous warbler *(Setophaga plumbea)* | bird | 1 |
| Polynesian rat *(Rattus exulans)* | mammal | 1 |
| Pyrenean chamois *(Rupicapra pyrenaica)* | mammal | 1 |
| rainbow lorikeet *(Trichoglossus haematodus)* | bird | 1 |
| red kite *(Milvus milvus)* | bird | 1 |
| red river hog *(Potamochoerus porcus)* | mammal | 1 |
| red squirrel *(Sciurus vulgaris)* | mammal | 1 |
| red wattlebird *(Anthochaera carunculate)* | bird | 1 |
| red-browed finch *(Neochmia temporalis)* | bird | 1 |
| red-capped parrot *(Purpureicephalus spurius)* | bird | 1 |
| red-shouldered hawk *(Buteo lineatus)* | bird | 1 |
| red-tailed hawk *(Buteo jamaicensis)* | bird | 1 |
| reed bunting *(Emberiza schoeniclus)* | bird | 1 |
| reed warbler *(Acrocephalus scirpaceus)* | bird | 1 |
| ricefield rat *(Rattus argentiventer)* | mammal | 1 |
| ring-tailed cat *(Bassariscus astutus)* | mammal | 1 |
| rock warbler *(Origma solitaria)* | bird | 1 |
| rocky mountain elk *(Cervus elaphus nelsoni)* | mammal | 1 |
| ruddy turnstone *(Arenaria interpres)* | bird | 1 |
| rufous hare-wallaby *(Lagorchestes hirsutus)* | mammal | 1 |
| rufous-legged owl *(Strix rufipes)* | bird | 1 |
| rufous nightingale *(Luscinia megarhynchos)* | bird | 1 |
| sable *(Martes zibellina)* | mammal | 1 |
| Saker falcon *(Falco cherrug)* | bird | 1 |
| sand martin *(Riparia riparia)* | bird | 1 |
| sand partridge *(Ammoperdix heyi)* | bird | 1 |
| sandpiper *(Actitis hypoleucos)* | bird | 1 |
| sandstone false antechinus *(Parantechinus bilarni)* | mammal | 1 |
| sandy inland mouse *(Pseudomys hermannsburgensis)* | mammal | 1 |
| Santa Maria goldcrest *(Regulus regulus sanctae mariae)* | bird | 1 |
| Sao Miguel goldcrest *(Regulus regulus azoricus)* | bird | 1 |
| Sardinian warbler *(Sylvia melanocephala)* | bird | 1 |
| satin bowerbird *(Ptilonorhynchus violaceus)* | bird | 1 |
| scaly-breasted lorikeet *(Trichoglossus chlorolepidotus)* | bird | 1 |
| scaly-breasted thrasher *(Margarops fuscus)* | bird | 1 |
| semipalmated sandpiper *(Calidris pusilla)* | bird | 1 |
| Serotine bat *(Eptesicus serotinus)* | mammal | 1 |
| sharp-shinned hawk *(Accipiter striatus)* | bird | 1 |
| short-eared possum *(Trichosurus caninus)* | mammal | 1 |
| short-toed eagle *(Circaetus gallicus)* | bird | 1 |
| shoveler duck *(Spatula clypeata)* | bird | 1 |
| sika deer *(Cervus nippon)* | mammal | 1 |
| silky mouse *(Pseudomys apodemoides)* | mammal | 1 |
| silky short-tailed bat *(Carollia brevicauda)* | mammal | 1 |
| sitatunga *(Tragelaphus spekii)* | mammal | 1 |
| slender-tailed dunnart *(minthopsis murina)* | mammal | 1 |
| small Japanese field mouse *(Apodemus argenteus)* |  mammal | 1 |
| smooth weakfish *(Cynoscion leiarchus)* | fish | 1 |
| song thrush *(Turdus philomelos)* | bird | 1 |
| South American tapir *(Tapirus terrestris)* | mammal | 1 |
| Southern brown bandicoot *(Isoodon obesulus)* | mammal | 1 |
| Southern elephant seal *(Mirounga leonine)* | mammal | 1 |
| Southern hairy-nosed wombat *(Lasiorhinus latifrons)* | mammal | 1 |
| Southern kingcroaker *(Menticirrhus americanus)* | fish | 1 |
| Southern pygmy mouse *(Baiomys musculus)* | mammal | 1 |
| spectacled eider *(Somateria fischeri)* | bird | 1 |
| spectacled monarch *(Monarcha trivirgatus)* | bird | 1 |
| Spinifex hopping mouse *(Notomys alexis)* | mammal | 1 |
| spiny-cheeked honeyeater *(Acanthagenys rufogularis)* | bird | 1 |
| spot-billed duck *(Anas poecilorhyncha)* | bird | 1 |
| spotted bowerbird *(Chlamydera maculata)* | bird | 1 |
| spotted dove *(Streptopelia chinensis)* | bird | 1 |
| spotted eagle *(Aquila pomarina)* | bird | 1 |
| spotted harrier *(Circus assimilis)* | bird | 1 |
| spotted hyena *(Crocuta crocuta)* | mammal | 1 |
| springbok *(Antidorcas marsupialis)* | mammal | 1 |
| steppe eagles *(Aquila nipalensis)* | bird | 1 |
| straw-colored fruit bat *(Eidolon helvum)* | mammal | 1 |
| straw-necked ibis *(Threskiornis spinicollis)* | bird | 1 |
| streaked shearwater *(Calonectris leucomelas)* | bird | 1 |
| stripe-faced dunnart *(Sminthopsis macroura)* | mammal | 1 |
| sugar glider *(Petaurus breviceps)* | mammal | 1 |
| sulphur-crested cockatoo *(Cacatua galerita)* | bird | 1 |
| superb fairywren *(Malurus cyaneus)* | bird | 1 |
| swamp harrier *(Circus approximans)* | bird | 1 |
| swamp quail *(Coturnix ypsilophora)* | bird | 1 |
| Tanezumi rat *(Rattus tanezumi)* | mammal | 1 |
| Tasmanian devil *(Sarcophilus harrisii)* | mammal | 1 |
| tawny frogmouth *(Podargus strigoides)* | bird | 1 |
| tawny pipit *(Anthus campestris)* | bird | 1 |
| tufted puffin *(Fratercula cirrhata)* | bird | 1 |
| tundra swan *(Cygnus columbianus)* | bird | 1 |
| turkey vulture *(Cathartes aura)* | bird | 1 |
| upland buzzard *(Buteo hemilasius)* | bird | 1 |
| ural field mouse *(Apodemus microps)* | mammal | 1 |
| varied honeyeater *(Lichenostomus versicolor)* | bird | 1 |
| varied tit *(Parus varius)* | bird | 1 |
| Vega gull *(Larus vegae)* | bird | 1 |
| vervet monkey *(Chlorocebus pygerythrus)* | mammal | 1 |
| Virginia opossum *(Didelphis virginiana)* | mammal | 1 |
| volcano rabbit *(Romerolagus diazi)* | mammal | 1 |
| warthog *(Phacochoerus africanus)* | mammal | 1 |
| waterbuck *(Kobus ellipsiprymnus)* | mammal | 1 |
| Weddell seal *(Leptonychotes weddellii)* | mammal | 1 |
| welcome swallow *(Hirundo neoxena)* | bird | 1 |
| West Indian manatee *(Trichechus manatus)* | mammal | 1 |
| Western Azores goldcrest *(Regulus regulus inermis)* | bird | 1 |
| Western grey kangaroo *(Macropus fulginosus)* | mammal | 1 |
| Western pygmy possum *(Cercartetus concinnus)* | mammal | 1 |
| Western swamphen *(Porphyrio porphyrio)* | bird | 1 |
| white mullet *(Mugil curema)* | fish | 1 |
| White’s thrush *(Zoothera dauma)* | bird | 1 |
| white wagtail *(Motacilla alba)* | bird | 1 |
| white-bellied green pigeon *(Treron sieboldii)* | bird | 1 |
| white-browed babbler *(Pomatostomus uperciliosus)* | bird | 1 |
| white-browed scrubwren *(Sericornis frontalis)* | bird | 1 |
| white-cheeked starling *(Sturnus cineraceus)* | bird | 1 |
| white-faced heron *(Egretta novaehollandiae)* | bird | 1 |
| white-naped crane *(Grus vipio)* | bird | 1 |
| white-necked heron *(Ardea pacifica)* | bird | 1 |
| white-nosed coati *(Nasua narica)* | mammal | 1 |
| white-plumed honeyeater *(Lichenostomus penicillatus)* | bird | 1 |
| white-spectacled bulbul *(Pycnonotus xanthopygos)* | bird | 1 |
| white-tailed eagle *(Haliaeetus albicilla)* | bird | 1 |
| white-throated dipper *(Cinclus cinclus)* | bird | 1 |
| white-throated rat *(Neotoma albigula)* | mammal | 1 |
| Willie wagtail *(Rhipidura leucophrys)* | bird | 1 |
| willow tit *(Poecile montanus)* | bird | 1 |
| willow warbler *(Phylloscopus trochilus)* | bird | 1 |
| Wongai ninguai *(Ningaui ridei)* | mammal | 1 |
| woodpigeon *(Columba palumbus)* | bird | 1 |
| yellow bittern *(Ixobrychus sinensis)* | bird | 1 |
| yellow warbler *(Setophaga petechia)* | bird | 1 |
| yellow-backed duiker *(Cephalophus sylvicultor)* | mammal | 1 |
| yellow-faced honeyheater *(Lichenostomus chrysops)* | bird | 1 |
| yellow-legged gull *(Larus cachinnans)* | bird | 1 |
| yellow-throated scrubwren *(Sericornis citreogularis)* | bird | 1 |
| yellowhammer *(Emberiza citrinella)* | bird | 1 |
| zebra *(Equus quagga)* | mammal | 1 |
| zebra dove *(Geopelia striata)* | bird | 1 |
| zebra finch *(Taeniopygia guttata)* | bird | 1 |
| Zenaida dove *(Zenaida aurita)* | bird | 1 |

**Table S4.**

References cited within figure 4.

1. (Levy et al. 1976; Linton et al. 1977)
2. (Rotimi and Duerden 1981)
3. (Grönthal et al. 2018; Vega-Manriquez et al. 2020)
4. (Belongia et al. 1993)
5. (Ngaiganam et al. 2019)
6. (Jardine et al. 2012)
7. (Franklin et al. 2013; Laidler et al. 2013)
8. (Lindeberg et al. 2018)
9. (Crump et al. 2002; Fairbrother and Nadeau 2006)
10. (Ahmad et al. 2007)
11. (Moodley and Guardabassi 2009)
12. (Fuentes-Castillo et al. 2019)
13. (Chiyo et al. 2014)
14. (Furness et al. 2017)
15. (VanderWaal et al. 2014; Miller et al. 2018)
16. (Nowak et al. 2017; Nowakiewicz et al. 2020)
17. (Cole et al. 2005; Middleton and Ambrose 2005)
18. (Schierack et al. 2009; Literak et al. 2010; Alonso et al. 2017)
19. (Suenaga et al. 2019)
20. (Sellera et al. 2018)
21. (Santos et al. 2013; Ramey et al. 2018)

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