



### CamTrapAsia: 210 full wildlife capture lists from camera trapping studies

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Substantive Area:	Conservation < Population Ecology < Substantive Area, Distributions/Patchiness/Marginal Populations < Population Dynamics and Life History < Population Ecology < Substantive Area, Data paper < Data < Substantive Area
Organism:	Vertebrates < Animals, Mammals < Vertebrates < Animals, Birds (specify type in field below) < Vertebrates < Animals, Reptiles < Vertebrates < Animals
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Data_S1.rar	

- 1 Ecology
- 2 Data paper
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131 **Open Research statement:**

132 The data and code are available in the GitHub directory <<https://github.com/CalebePMendes/CamTrapAsia.git>>

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For Review Only

**Abstract**

Southeast Asia holds some of the most diverse rainforests on the planet. Despite their importance, information on biodiversity is scattered across published, peer-reviewed, and gray literature and in unpublished raw data. Camera traps are an effective non-invasive method of surveying vertebrates. In this data paper, we compiled and standardized 210 camera trap surveys from across Southeast Asia. The camera deployments included in this study used relatively standardized methods, providing a consistent and reliable data set relative to other large-scale occurrence datasets such as online citizen science repositories. The complete data set comprises 276,805 records of 360 species (225 mammals, 129 birds, and 6 reptiles), making it one of the most extensive and comprehensive biodiversity inventories for the region. The information detailed in this data paper opens opportunities for single-species ecological or conservation studies as well as community ecology and macroecology investigations. For example, the dataset may be useful to understand the effects of habitat loss, fragmentation, climate change, and other human-mediated processes on species and communities. for future ecological research that could be replicated through time and in other regions.

## Supplementary Materials:

### Introduction

Camera traps have existed in some form since 1890 and revolutionized wildlife research since the late 1990s (O'Connell, Nichols, and Karanth 2010). There are numerous advantages to cameras, including researcher time or capacity, automatically triggered cameras remove much of the observer bias present in humans. Since 2005, most cameras are digital and detect the heat signature from animals moving within the sensor range, photos are later sorted, and captures (or detections) are noted when a species is present. Cameras monitor wildlife with minimal disturbance, both day and night, contributing to biodiversity inventories (species richness) and images are time-stamped to allow for investigations on topics like wildlife behaviour (e.g. temporal activity patterns). The development of hierarchical modelling methods including mark-recapture for density and occupancy analyses - and the inclusion of covariates into these models - have given scientists a robust glimpse into the ecology of cryptic animals in their natural environments (O'Connell, Nichols, and Karanth 2010; Sollmann 2018).

Camera traps and associated analyses play an important role in monitoring animal populations during the Anthropocene 6<sup>th</sup> mass extinction (Ceballos et al. 2015). Over 60% of the earth's forest landscapes suffer some degree of degradation (Grantham et al. 2020) and widespread poaching has driven declines >25% of the vertebrate species (Dirzo et al. 2014). Climate change is the next great threat (IPCC 2014). Addressing these challenges requires far larger data volumes than any single research team or organization can collect or manage. Further, monitoring for global and regional trends requires long time series, so there needs to be systematic handing down of projects and datasets to the next generation of scientists, and ideally redundancy to ensure the continuation of critical longitudinal measurements (Beaudrot et al. 2016). These aims can only be met via collaboration and data sharing. The CamTrapAsia dataset for Southeast Asian tropical and subtropical forests joins other open online camera trap images and data repositories (Ahumada et al. 2020; Lima et al. 2017).

CamTrapAsia only mobilizes the full capture lists (e.g. we excluded studies that only reported a single species or subset of species) and includes numerous covariates for each study, in a single standardized and accessible format. Providing these covariates is aimed to remove barriers to science. While we endeavoured to exhaustively search the white and grey literature for all available information and requested missing information from authors, we estimate our dataset contains just 20% of the camera trapping conducted to date in the region as much is never published in any form or only selective animal detections are published. There is work yet to be done.

**Methods**

We searched for Asian camera trap studies using many approaches. We started with a Web of Science using terms “camera\*” and Asia\* or Thai\* or Malaysia\* or Indonesia\* or Singapore\* or Borneo\* or Cambodia\* or Vietnam\* or Lao\* or Myanmar\* or Burm\* or Sumatra\* or Borne\*. We also used Google Scholar using the terms camera\* AND vertebrate\* or mammal\* or bird\* or biodiverse\* or richness or Endangered or Threatened or terrestrial or distribution\* or abundance\* or carnivor\* or herbiv\* or omnivor\* or predator\* tiger\* or leopard\* or rhino\* or elephant\* or tapir\* or deer\* or civet\*.

Criteria for inclusion of published data were: (i) a complete list of the vertebrate species >1 kg detected, the number of independent records, the trapping effort (with a minimum of 25 trap nights), the number of cameras/stations deployed, the coordinates of the study site and the period when the trapping survey was performed (with a minimum temporal precision of year). The data matching the required criteria was collated in a single table, together with the references needed to locate the original publication. The collated data set was standardized, with all coordinates set to WGS 84, and the species binomial names were verified using the R package Taxize (Chamberlain et al. 2022), based in the taxonomic databases from the National Center for Biotechnology Information and the Global Biodiversity Information Facility (Schoch et al. 2020; GBIF 2022).

To facilitate the usage of this dataset, we also made available a set of 13 spatial covariables including the percentage of forest cover, altitude, terrain roughness, forest landscape integrity index (FLII), human footprint index, ecoregion intactness index, average precipitation, average temperature, night light emissivity, human population, percentage of oil palm, percentage of urban areas and, percentage of protected areas), extracted in 3 spatial scales around the survey locations (10, 20 and 30 km radius). We also added a set of biological traits (adult body mass, percentage of diet composed by invertebrates, percentage of diet composed by vertebrates, percentage of diet composed by plants, diet breadth, trophic level, activity cycle and habitat breadth) for the recorded species extracted from the combine dataset (Soria et al. 2021). Finally, the resulting data set is provided as a three of .csv tables and as a Darwin Core archive, and available on GBIF. The R code used to assemble the dataset and standardize the species names is also provided.

## Results

CamTrapAsia contains 210 surveys from 133 sites (as labelled in the original papers) from 89 landscapes (here defined as an area encompassing one or more forest patches within 20 km of each other, and which share similar socio-environmental conditions). The geographical coverage was 11 countries including Indonesia, Singapore, Malaysia, Bhutan, Thailand, Myanmar, Cambodia, Laos, Vietnam, Nepal and far-eastern India (Fig 1 and 2). The temporal coverage spans from 1987 to 2020 (Fig 3). There were 276,805 records from 10,024 camera stations over 561,292 trap nights. A total of 360 species were recorded, from 173 genera and 70 families. Mammals comprised 62.5% of the species (fig 4 and 5), birds comprised 35.8% (fig 6 and 7), and the remaining were reptiles. The most recorded species was *Sus scrofa* with 42,269 records, followed by *Macaca nemestrina* (n = 32,964) and *Muntiacus muntjac* (n = 23,796). A total of 45 species were recorded just once (singletons). The most recorded families were Cervidae, Suidae and Cercopithecidae, with 52,087, 52,076 and 45,891 records respectively. There were 8 families with species recorded once. The structure of the data is described in the tables 1,2 and 3.

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**Conflict of Interest Statement**

The authors have no conflicts of interest to declare.

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338 **Table 1:** metadata.csv

Field Name	Description	Range	NAs	Example	Source
<b>survey_id</b>	Unique ID which connects the records from the metadata table with the capture table.	NA	0	Lambir2017.ECL	compiler
<b>region</b>	General region where sampling was performed	NA	0	Southeast_Asia	original authors
<b>country</b>	Country where sampling was performed	NA	0	Indonesia	original authors
<b>site</b>	Name of the location where sampling was performed	NA	0	Leuser_forest_fragments	original authors
<b>effort</b>	Trapping effort, in trap-nights	28 - 32027	0	45	original authors
<b>size_km2</b>	Size of the forest where the sampling was performed, in km <sup>2</sup>	0.14 - 278889.37	12	1.80	original authors
<b>Protected_area</b>	Whether the sampling happened within a protected area	"y" for protected areas, "n" for not protected areas and "Mixed" when only a part of the area is protected	22	y	original authors
<b>Y_lat</b>	Latitude in decimal degrees, using WGS84	-8.7 to 33.0	0	3.972066	original authors
<b>X_long</b>	Longitude in decimal degrees, using WGS84	80.2 to 140.1	0	98.08855	original authors
<b>logging</b>	Whether the area was previously logged, not-logged or in a plantation	"logged", "not_logged", "plantation" and "mixed" which includes cameras in both logged and unlogged areas	93	logged	original authors
<b>logging_obs</b>	Observations about logging	text	97	logged	original authors or compiler
<b>edge_1km</b>	Whether the sapling was performed within 1 km from an edge	"edge" for sampling within 1 km of the nearest edge, "interior" for sites farther than 1 km, "both" for sampling with cameras in both edge and interior.	123	edge	original authors
<b>year_start</b>	Year of the start of the trapping survey	1987 - 2020	0	2014	original authors
<b>year_end</b>	Year of the ending of the trapping survey	1988 - 2020	0	2014	original authors
<b>monthstart</b>	Month of the start of the trapping survey	1 to 12	4	1	original authors

<b>monthfinish</b>	Month of the ending of the trapping survey	1 to 12	6	2	original authors
<b>n_points</b>	Number of sampling points in the survey	1 - 310	3	1	original authors
<b>n_cameras</b>	Number of cameras deployed in the survey	1 - 600	0	1	original authors
<b>cam_spacing</b>	Minimum space between cameras, in meters	60 - 4000	46	1000	original authors
<b>area_cover_km2</b>	Area of the minimum convex polygon of the sampling points in a survey, in km <sup>2</sup>	0.04 - 1357	89	NA	original authors
<b>indent_cap_mins</b>	Minimum time allowed between two independent records, in minutes	0 - 60	21	60	original authors
<b>forest_type</b>	Type of forest in which the sampling was deployed	NA	77	Evergreen broadleaf	original authors
<b>study_notes</b>	Notes about the study from which the camera trap data was obtained	NA	172	NA	compiler
<b>veg_notes</b>	Notes about the vegetation where the sampling was deployed	NA	72	Frag	NA
<b>study_author</b>	Correspondent author of the study/data	NA	0	Luskin et al. 2017	original authors
<b>Source</b>	Link or citation to the original publication or the author contact.	NA	0	<a href="https://www.nature.com/articles/s41467-017-01656-4">https://www.nature.com/articles/s41467-017-01656-4</a>	original authors
<b>forest_cover_10km</b>	Percentage of area covered by vegetation above 4m in a 10km buffer around the sampling coordinates	0 to 78.22	0	60.26213169	(Sexton et al. 2013)
<b>forest_cover_20km</b>	Percentage of area covered by vegetation above 4m in a 20km buffer around the sampling coordinates	0 to 75.79	0	57.71243796	(Sexton et al. 2013)
<b>forest_cover_30km</b>	Percentage of area covered by vegetation above 4m in a 30km buffer around the sampling coordinates	0 to 74.92	0	54.05373898	(Sexton et al. 2013)
<b>altitude_10km</b>	Average altitude in a 10km buffer around the sampling coordinates, in meters	8 to 4798.25	0	56.88501509	(Jaxa 2015)
<b>altitude_20km</b>	Average altitude in a 20km buffer around the sampling coordinates, in meters	9.39 to 4960.17	0	107.5634248	(Jaxa 2015)
<b>altitude_30km</b>	Average altitude in a 30km buffer around the sampling coordinates, in meters	9.13 to 5005.22	0	219.5147203	(Jaxa 2015)

<b>roughness_10km</b>	Roughness index, calculated using the R function terra::terrain() with option v = "roughness", in 10km buffer around the sampling coordinates, in meters	2.85 to 68.80	0	14.36782614	(Jaxa 2015; Hijmans 2022)
<b>roughness_20km</b>	Roughness index, calculated using the R function terra::terrain() with option v = "roughness", in 20km buffer around the sampling coordinates, in meters	2.62 to 59.13	0	17.58147274	(Jaxa 2015; Hijmans 2022)
<b>roughness_30km</b>	Roughness index, calculated using the R function terra::terrain() with option v = "roughness", in 30km buffer around the sampling coordinates, in meters	2.94 to 56.25	0	19.45138369	(Jaxa 2015; Hijmans 2022)
<b>FLII_10km</b>	Forest Landscape Integrity Index in 10 km buffer around the sampling coordinates, unitless	0 to 9.98	2	5.459989231	(Grantham et al. 2020)
<b>FLII_20km</b>	Forest Landscape Integrity Index in 20 km buffer around the sampling coordinates, unitless	0 to 9.75	1	5.175927237	(Grantham et al. 2020)
<b>FLII_30km</b>	Forest Landscape Integrity Index in 30 km buffer around the sampling coordinates, unitless	0 to 9.63	1	5.403120846	(Grantham et al. 2020)
<b>human_footprint_10km</b>	Human Footprint Index in 10 km buffer around the sampling coordinates, unitless	0.14 to 94.66	0	9.853968254	(Venter et al. 2018)
<b>human_footprint_20km</b>	Human Footprint Index in 20 km buffer around the sampling coordinates, unitless	1.16 to 95.77	0	11.97931583	(Venter et al. 2018)
<b>human_footprint_30km</b>	Human Footprint Index in 30 km buffer around the sampling coordinates, unitless	1.42 to 103.79	0	15.08300954	(Venter et al. 2018)
<b>ecoregion_intactness_10km</b>	Ecoregion Intactness Index in 10 km buffer around the sampling coordinates, unitless	0 to 787.88	0	53.77821012	(Beyer et al. 2020)
<b>ecoregion_intactness_20km</b>	Ecoregion Intactness Index in 20 km buffer around the sampling coordinates, unitless	0 to 661.38	0	57.35282651	(Beyer et al. 2020)
<b>ecoregion_intactness_30km</b>	Ecoregion Intactness Index in 30 km buffer around the sampling coordinates, unitless	0.12 to 636.78	0	87.49029982	(Beyer et al. 2020)

<b>precipitation_10km</b>	Mean annual precipitation in 10km buffer around the sampling coordinates, in mm	585.362637362637 - 4105.63561643836	0	2616.955801	WorldClim 2.1 ( <a href="http://worldclim.org">http://worldclim.org</a> )
<b>precipitation_20km</b>	Mean annual precipitation in 20km buffer around the sampling coordinates, in mm	567.015068493151 - 4134.70378006873	0	2614.322536	WorldClim 2.1 ( <a href="http://worldclim.org">http://worldclim.org</a> )
<b>precipitation_30km</b>	Mean annual precipitation in 30km buffer around the sampling coordinates, in mm	567.131466828971 - 3935.06654456654	0	2588.659534	WorldClim 2.1 ( <a href="http://worldclim.org">http://worldclim.org</a> )
<b>temperature_10km</b>	Mean annual temperature in 10km buffer around the sampling coordinates, in degrees Celsius	-1.81 to 27.98	0	25.97048802	WorldClim 2.1 ( <a href="http://worldclim.org">http://worldclim.org</a> )
<b>temperature_20km</b>	Mean annual temperature in 20km buffer around the sampling coordinates, in degrees Celsius	-2.36 to 28.04	0	25.72089934	WorldClim 2.1 ( <a href="http://worldclim.org">http://worldclim.org</a> )
<b>temperature_30km</b>	Mean annual temperature in 30km buffer around the sampling coordinates, in degrees Celsius	-2.26 to 28.03	0	25.14833225	WorldClim 2.1 ( <a href="http://worldclim.org">http://worldclim.org</a> )
<b>nighttime_lights_10km</b>	Mean artificial light emissivity during nighttime in 10km buffer around the sampling coordinates, in microflicks	-0.31 to 50.49	0	0.30145052	(Elvidge et al. 2021)
<b>nighttime_lights_20km</b>	Mean artificial light emissivity during nighttime in 20km buffer around the sampling coordinates, in microflicks	-0.41 to 38.77	0	0.420156367	(Elvidge et al. 2021)
<b>nighttime_lights_30km</b>	Mean artificial light emissivity during nighttime in 30km buffer around the sampling coordinates, in microflicks	-0.39 to 23.99	0	0.527438576	(Elvidge et al. 2021)
<b>human_population_10km</b>	Human population in a 10km buffer around the sampling coordinates	0 to 3418112	0	8533.319525	(European Commission et al. 2019)
<b>human_population_20km</b>	Human population in a 20km buffer around the sampling coordinates	0 to 6413067	0	77634.95748	(European Commission et al. 2019)
<b>human_population_30km</b>	Human population in a 30km buffer around the sampling coordinates	335 to 7188317	0	265187.7767	(European Commission et al. 2019)
<b>oil_palm_10km</b>	Percentage of area covered by oil palm plantations in 10km	0 to 62.58	0	28.0820553674567	(Miettinen, Shi, and Liew 2016)

	buffer around the sampling coordinates				
<b>oil_palm_20km</b>	Percentage of area covered by oil palm plantations in 20km buffer around the sampling coordinates	0 to 64	0	31.3603581198707	(Miettinen, Shi, and Liew 2016)
<b>oil_palm_30km</b>	Percentage of area covered by oil palm plantations in 30km buffer around the sampling coordinates	0 to 31.39	0	24.9347604936087	(Miettinen, Shi, and Liew 2016)
<b>urban_areas_10km</b>	Percentage of area covered human settlements in 10km buffer around the sampling coordinates	0 to 46.08	0	0	(FAO et al. 2014)
<b>urban_areas_20km</b>	Percentage of area covered human settlements in 20km buffer around the sampling coordinates	0 to 24.17	0	0.12303486	(FAO et al. 2014)
<b>urban_areas_30km</b>	Percentage of area covered human settlements in 30km buffer around the sampling coordinates	0 to 11.80	0	0.579732197	(FAO et al. 2014)
<b>protected_areas_10km</b>	Percentage of area protected in 10km buffer around the sampling coordinates	0 to 100	0	57.70151636	(UNEP-WCMC and IUCN 2021)
<b>protected_areas_20km</b>	Percentage of area protected in 20km buffer around the sampling coordinates	0 to 100	0	35.98726115	(UNEP-WCMC and IUCN 2021)
<b>protected_areas_30km</b>	Percentage of area protected in 30km buffer around the sampling coordinates	0 to 100	0	28.62700027	(UNEP-WCMC and IUCN 2021)

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341 Table 2: captures.csv

Field Name	Description	Range	NAs	Example	Source
survey_id	Unique ID which connects the records from the capture table with the metadata table.	NA	0	Lambir2017.ECL	compiler
records	Number of independent records	0 - 3644	0	3	original authors
Y_lat	Latitude in decimal degrees, using WGS84	-8.71 to 33.02	0	3.972066	original authors
X_long	Longitude in decimal degrees, using WGS84	80.25 to 140.09	0	98.08855	original authors
year_start	Year of the start of the trapping survey	1987 - 2020	0	2014	original authors
country	Country where sampling was performed	NA	0	Malaysia	original authors
domestic	States whether the species recorded is domestic or wild	"domestic" or "wild"	0	wild	IUCN Red List
uri	Link for the species webpage at the NCBI or GBIF	NA	0	<a href="https://www.ncbi.nlm.nih.gov/taxonomy/37029">https://www.ncbi.nlm.nih.gov/taxonomy/37029</a>	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
species	Species name of the recorded animal (when identified to the species taxonomic level)	NA	549	bengalensis	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
genus	Genus name of the recorded animal (when identified at least to the genus taxonomic level)	NA	234	Prionailurus	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
family	Family name of the recorded animal (when identified at least to the family taxonomic level)	NA	102	Felidae	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
order	Order name of the recorded animal (when identified at least to the order taxonomic level)	NA	0	Carnivora	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
class	Class name of the recorded animal (when identified at least to the class taxonomic level)	Aves, Mammalia or Reptilia	0	Mammalia	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
binomial_verified	Binomial name of the animal recorded, verified in the NCBI or GBIF database.	NA	0	Prionailurus bengalensis	original authors, verified by NCBI or GBIF
taxonomic_level	Taxonomic level in which the animal record was identified	species, genus, order or family	0	species	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)

342 NCBI - National Center for Biotechnology Information ([www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov))

343 GBIF - Global Biodiversity Information Facility ([www.gbif.org](http://www.gbif.org))

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346 Table 3: species\_traits.csv

Field Name	Description	Range	NAs	Example	Source
uri	Link for the species webpage at the NCBI or GBIF	NA	0	<a href="https://www.ncbi.nlm.nih.gov/taxonomy/9691">https://www.ncbi.nlm.nih.gov/taxonomy/9691</a>	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
species	Species name of the recorded animal (when identified to the species taxonomic level)	NA	63	pardus	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
genus	Genus name of the recorded animal (when identified at least to the genus taxonomic level)	NA	33	Panthera	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
family	Family name of the recorded animal (when identified at least to the family taxonomic level)	NA	8	Felidae	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
order	Order name of the recorded animal (when identified at least to the order taxonomic level)	NA	0	Carnivora	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
class	Class name of the recorded animal (when identified at least to the class taxonomic level)	Aves, Mammalia or Reptilia	0	Mammalia	(Schoch et al. 2020; GBIF 2022; Chamberlain et al. 2022)
binomial_verified	Binomial name of the animal recorded, verified in the NCBI or GBIF database.	NA	0	Panthera pardus	original authors, verified by NCBI or GBIF
taxonomic_level	Taxonomic level in which the animal record was identified	species, genus, order or family	0	species	original authors, verified by NCBI or GBIF
adult_mass_g	Average body mass of an adult individual, in grams	25.99 to 3220000	192	53075	(Soria et al. 2021)
dphy_invertebrate	Percentage of the diet composed by invertebrates	0 to 100	192	0	(Soria et al. 2021)
dphy_vertibrate	Percentage of the diet composed by vertebrates	0 to 100	192	100	(Soria et al. 2021)
dphy_plant	Percentage of the diet composed by plants	0 to 100	192	0	(Soria et al. 2021)
det_diet_breadth_n	Number of dietary categories with consumption above 20%, based on EltonTraits	1 to 4	192	1	(Soria et al. 2021)
trophic_level	Trophic level of the species recorded	1 for herbivores, 2 for omnivores and	192	3	(Soria et al. 2021)



		3 for carnivores			
activity_cycle	Dial activity cycle of the recorded species	1 for strictly nocturnal, 2 for cathemeral and crepuscular, 3 for strictly diurnal species	192	1	(Soria et al. 2021)
habitat_breadth_n	Number of habitats suitable for the species, based on IUCN	1-7	198	6	(Soria et al. 2021)
iucn2020_binomial	Binomial name of the recorded animal, based on the IUCN taxonomic database	Accipiter gentilis - Zoothera dauma	0	Panthera pardus	(IUCN 2022; Chamberlain et al. 2022)
IUCN	IUCN redlist status	CR - VU	84	VU	(IUCN 2022)

347 NCBI - National Center for Biotechnology Information ([www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov))

348 GBIF - Global Biodiversity Information Facility ([www.gbif.org](http://www.gbif.org))

349 IUCN - The International Union for Conservation of Nature ([www.iucn.org](http://www.iucn.org))

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**Figure captions**

**Figure 1.** Map of the collated camera trap records.

**Figure 2.** Species richness per survey.

**Figure 3.** Temporal distribution of the deployment dates for surveys. Note that it often takes years for surveys to be published and that covid shut down most research in 2020, explaining the relatively low number of surveys included with cameras deployed since 2020.

**Figure 4.** Independent detections per mammalian genus. A total of 104 genera of mammals were observed, from 13 orders.

**Figure 5.** Species, genus and order of the recorded mammals.

**Figure 6.** Independent detection per avian genus. A total of 72 genera of birds were observed from 14 orders. Note that many studies did not identify birds.

**Figure 7.** Species, genus and order of the recorded birds. Note that birds were not exhaustively identified in all surveys.

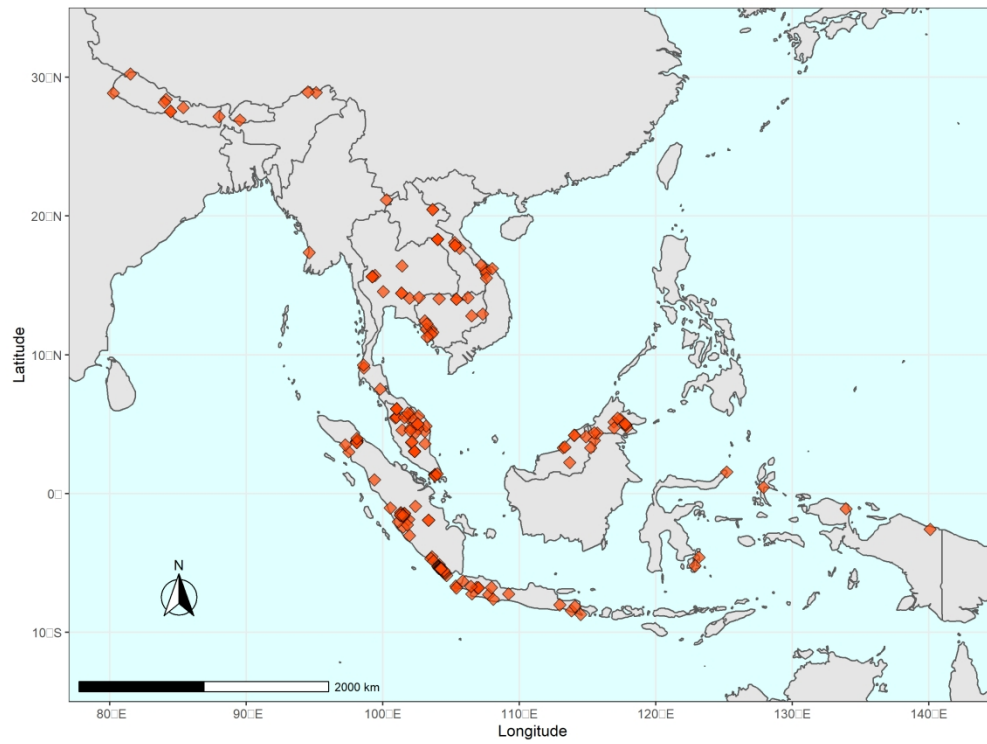


Figure 1

249x249mm (300 x 300 DPI)

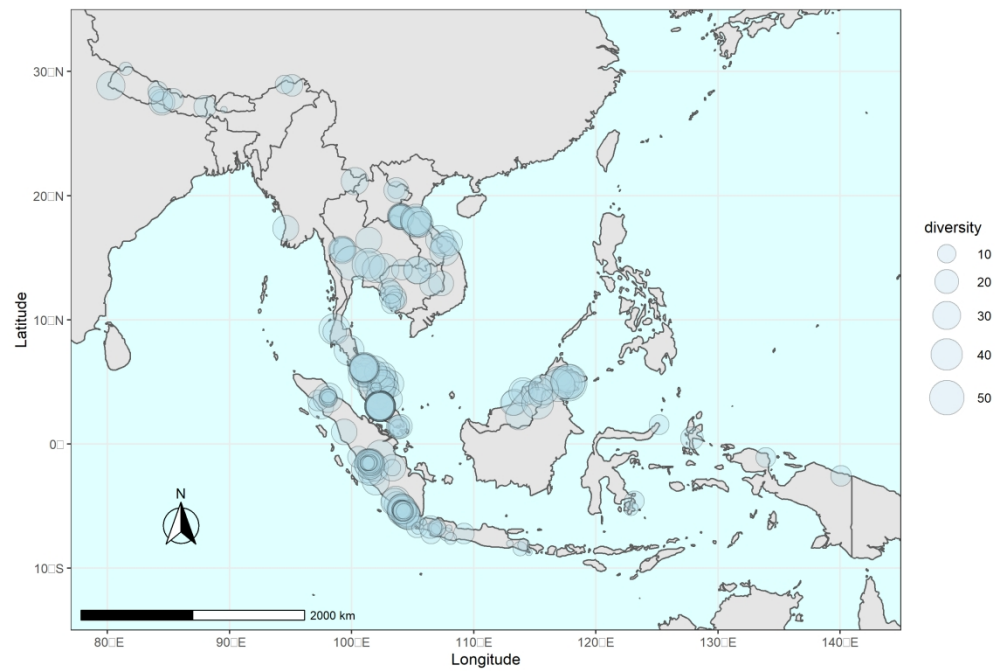


Figure 2

249x249mm (300 x 300 DPI)

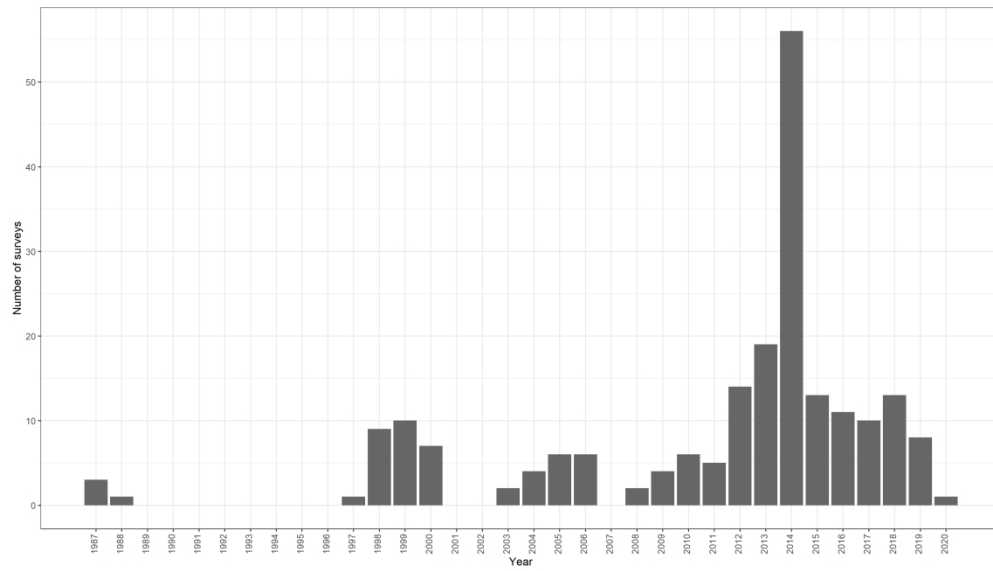
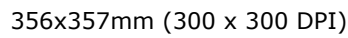


Figure 3

349x199mm (300 x 300 DPI)



449x299mm (300 x 300 DPI)





449x299mm (300 x 300 DPI)



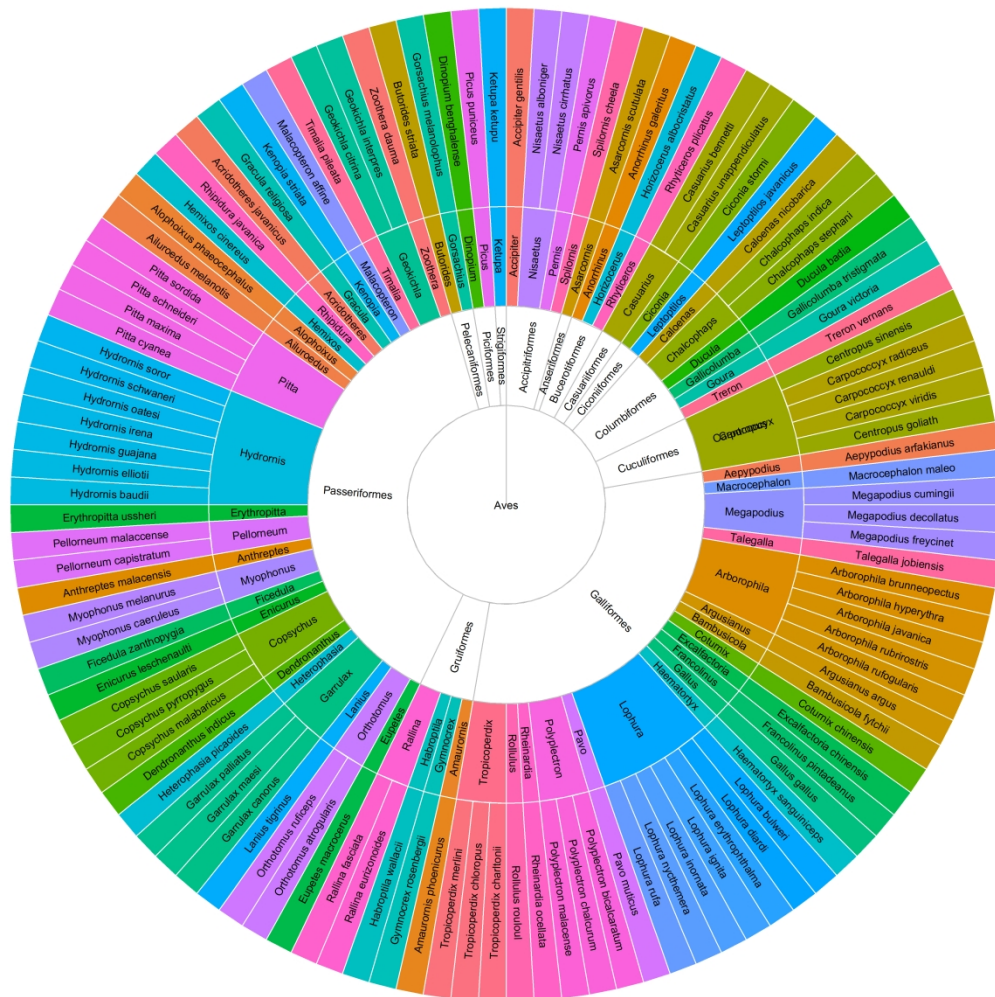


Figure 7

357x357mm (300 x 300 DPI)