**Supp. Table S1**. List of predictor variables, including definitions, measurement protocols, and coverage

| **Predictor** | **Sex and Life Stage** | **Coverage1** | **Predictor Definition and Measurement Protocol** | **Comments** |
| --- | --- | --- | --- | --- |
| **Biometric (morphological) predictor variables (data in Supp. Table S4)** |
| Body length  | a. Male adultb. Female adult, unengorged c. Female adult, partially engorged d. Female adult, fully engorgede. Nymph, unengorged f. Nymph, partially engorged g. Nymph, fully engorgedh. Larva, unengorged i. Larva, partially engorged j. Larva, fully engorged | 1.000.830.120.340.320.020.220.410.020.12 | Idiosomal length (mm) from scapular apices to posterior body margin (i.e., excludes the capitulum), measured dorsally (Cooley 1938). | The reported body length is often measured from the tip of the palps to the posterior body margin. However, the basis for the reported length varies among authors, who often do not define the measurement endpoints used for their published values. In this data set, we adjusted reported body lengths to match our definition when required, based on illustrations. |
| Body width | a. Male adultb. Female adult, unengorged c. Female adult, partially engorged d. Female adult, fully engorgede. Nymph, unengorged f. Nymph, partially engorged g. Nymph, fully engorgedh. Larva, unengorged i. Larva, partially engorged j. Larva, fully engorged | 1.000.800.120.320.290.020.170.390.020.12 | Idiosomal width (mm) between the outer margins of the body at the point of greatest width (Cooley 1938). |  |
| Capitulum length  | a. Male adultb. Female adultc. Nymphd. Larva | 0.930.880.610.56 | Gnathosomal length (mm) between two transverse lines, one touching the most anterior points of the palpi, the other touching the most posterior points on the cornua (for adults) or the posterior margin of the basis capitulum (for immatures), measured dorsally (Cooley 1938). |  |

Supp. Table S1 (continued)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Predictor** | **Sex and Life Stage** | **Coverage1** | **Predictor Definition and Measurement Protocol** | **Comments** |
| Capitulum width | a. Male adultb. Female adultc. Nymphd. Larva | 0.930.900.610.54 | Widest part of the capitulum (mm) measured either across the palpi or across the width of the basis capitulum, whichever is greater. | Capitulum width in the literature is always that of the basis capitulum. Our measurement endpoints were selected to be consistent with those used by Yang and Han (2018). |
| Clutch size | Female adult | 0.24 | Average number of eggs laid by a given tick species. |  |
| Dentition | a. Male adultb. Female adultc. Nymphd. Larva | 0.950.880.660.59 | Refers to the arrangement of denticles on the hypostome. In most cases, adult and immature *Dermacentor* tick species were assigned an integer value of 2 to 4, based on the average number of denticles. | Three *Dermacentor* species had variable dentition, in which case we assigned non-integer values (details in Supp. Table S4):* dentition = 2.5 for *D. auratus* nymph
* dentition = 3.5 for D. *dissimilis* male adult, *D. pavlovsky*i female adult, *D. silvarum* male and female adults.
 |
| Hypostome length | a. Male adultb. Female adultc. Nymphd. Larva | 0.830.830.590.54 | Distance (mm) between the apical tip of the hypostome and the point of insertion into the body, measured ventrally. For immatures, the point of insertion is the pH1 setae. |  |
| Hypostome width  | a. Male adultb. Female adultc. Nymphd. Larva | 0.800.800.610.51 | Greatest distance (mm) measured across the hypostome at right angles to its axis. |  |
| Metatarsus length | Metatarsus 1 a. Male adult b. Female adultMetatarsus 4 a. Male adult b. Female adult | 0.680.590.680.59 | Distance (mm) between the proximal end of the metatarsus and the distal end of the article (Cooley 1938). |  |

Supp. Table S1 (continued)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Predictor** | **Sex and Life Stage** | **Coverage1** | **Predictor Definition and Measurement Protocol** | **Comments** |
| Metatarsus width | Metatarsus 1 a. Male adult b. Female adultMetatarsus 4 a. Male adult b. Female adult | 0.680.590.680.59 | Greatest distance (mm) across the metatarsus at right angles to its axis. |  |
| Palp length | a. Male adultb. Female adultc. Nymphd. Larva | 0.930.880.610.54 | Distance (mm) between the anterior margin of the basis capituli and the most anterior point of article III, measured dorsally (Cooley 1938). | Palp length is sometimes calculated as the sum of articles II and III and other times as the sum of articles I, II, and III. The difference is insignificant for the purpose of this data set. |
| Palp width | a. Male adultb. Female adultc. Nymphd. Larva | 0.930.880.590.54 | Greatest distance (mm) across the palp at right angles to the axis of the member (Cooley 1938). |  |
| Scutum length | a. Male adultb. Female adultc. Nymphd. Larva | 0.950.900.630.56 | Scutum length (conscutum for male ticks) (mm) between the cephalic points of the scapulae to the posterior margin of the scutum, measured dorsally (Cooley 1938). |  |
| Scutum width | a. Male adultb. Female adultc. Nymphd. Larva | 0.930.900.630.56 | Width (mm) of scutum (conscutum for male ticks), measured dorsally at the widest point.  |  |

Supp. Table S1 (continued)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Predictor** | **Sex and Life Stage** | **Coverage1** | **Predictor Definition and Measurement Protocol** | **Comments** |
| Tarsus length | Tarsus 1 a. Male adult b. Female adult c. Nymph d. LarvaTarsus 4 a. Male adult b. Female adult c. Nymph d. Larva | 0.760.660.120.170.760.660.070.02 | Distance (mm) between the proximal end of the tarsus to the distal end of the article (Cooley 1938), ignoring the pseudoarticulation, which is generally represented in drawings by a line. |  |
| Tarsus width | Tarsus 1a. Male adultb. Female adultTarsus 4a. Male adultb. Female adult | 0.710.610.710.61 | Greatest distance (mm) across the tarsus measured at right angles to its axis. |  |
| **Host range predictor variables (data in, or derived from, Supp. Table S5)** |
| Number of host families | All stages | 0.98 | Numerical count of how many mammalian families a given tick species is known or suspected to infest (excluding human hosts) | Primary data sources were Guglielmone et al. (2014, 2020) and other published literature. The family to which each genus belongs, and the accepted family name, were checked against the hierarchical report in the Integrated Taxonomic Information System database (ITIS) website.  |
| Multiple host families | All stages | 0.98 | Binary indicator describing whether a given tick species is known to infest more than one family. |  |
| Number of host orders | All stages | 0.98 | Numerical count of how many host orders a given tick species is known to infest. | Used the same protocol for orders as that used for families. |

Supp. Table S1 (continued)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Predictor** | **Sex and Life Stage** | **Coverage1** | **Predictor Definition and Measurement Protocol** | **Comments** |
| Multiple host orders | All stages | 0.98 | Binary indicator describing whether a given tick species is known to infest more than one order. |  |
| Host phylogenetic diversity | All stages | 0.98 | Phylogenetic diversity of hosts for a given tick species | We calculated mean phylogenetic diversity of host species for each tick using the pd function from the picante package in R (Kembel et al. 2010). For this analysis, we used the phylogeny of Mammalia from Upham et al. 2019.  |
| Human infestation | All stages | 1.00 | Binary indicator describing whether a given tick species is known to infest humans. | Whether or not a *Dermacentor* species was known to infest humans was based on its characterization in Guglielmone et al. (2014, 2020). For assigning the binomial value, "human infestation" was categorized as "Yes"(assigned a value of '1') even if the infestation was classified as rare or very rare. |
| **Geographic distribution predictor (data in, or derived from, Supp. Table S6)** |
| Biome count | All stages | 0.98 | Numerical count of biomes in which a given *Dermacentor* species was found.  | The count of biomes was tallied using R packages to extract data from the terrestrial biomes and ecoregions of the world shapefile made by The Nature Conservancy (Dinerstein et al. 2017). |
| Ecoregion count | All stages | 0.98 | Numerical count of ecoregions in which a given *Dermacentor* species was found.  | Used the same protocol for ecoregions as that used for biomes. |
| Climate zone count | All stages | 0.98 | Numerical count of Köppen-Geiger climate zones in which a given *Dermacentor* species was found.  | Determined using ArcGIS layers from Beck et al. (2018) (1-km resolution). |

Supp. Table S1 (continued)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Predictor** | **Sex and Life Stage** | **Coverage1** | **Predictor Definition and Measurement Protocol** | **Comments** |
| **Other predictor variables** |
| Citation count | All stages | 1.00 | Number of hits when the accepted binomial of the tick species was searched on Web of Science. | Citation count searches were conducted on all collections on 4/10/22. Hits on synonyms were not searched. |
| **Dependent variable: Zoonotic vector status (data in Supp. Table S3)** |
| Vector status | All stages | 1.00 | Binary indicator describing whether the tick species has demonstrated the ability to transmit zoonotic pathogens to humans. | Zoonotic vector status was assigned based on the review article by Mathison & Sapp (2021). |

1 Coverage is defined as the proportion of *Dermacentor* species for which data were available for a given predictor.

**References**

**Beck, H. E., N. E. Zimmermann, T. R. McVicar, N. Vergopolan, A. Berg, and E. F. Wood. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution.** Sci. Data. 5: 180214.

**Cooley, R. A.** **1938**. The genera *Dermacentor* and *Otocentor* (Ixodidae) in the United States, with studies in variation. National Institute of Health Bulletin No. 171. U. S. Public Health Service, Washington, D.C.

**Dinerstein, E., D. Olson, A. Joshi, C. Vynne, N. D. Burgess, E. Wikramanayake, N. Hahn, S. Palminteri, P. Hedao, R. Noss, M. Hansen, H. Locke, E. C. Ellis, B. Jones, C. V. Barber, R. Hayes, C. Kormos, V. Martin, E. Crist, W. Sechrest, L. Price, J. E. M. Baillie, D. Weeden, K. Suckling, C. Davis, N. Sizer, R. Moore, D. Thau, T. Birch, P. Potapov, S. Turubanova, A. Tyukavina, N. de Souza, L. Pintea, J. C. Brito, O. A. Llewellyn, A. G. Miller, A. Patzelt, S. A. Ghazanfar, J. Timberlake, H. Klöser, Y. Shennan-Farpón, R. Kindt, J.-P. B. Lillesø, P. van Breugel, L. Graudal, M. Voge, K. F. Al-Shammari, and M. Saleem. 2017.** An ecoregion-based approach to protecting half the terrestrial realm. BioScience. 67: 534–545.

**Guglielmone, A. A., R. G. Robbins, D. A. Apanaskevich, T. N. Petney, A. Estrada-Peña, and I. G. Horak. 2014.** The hard ticks of the world (Acari: Ixodida: Ixodidae). Springer, Heidelberg, New York, London.

**Guglielmone, A. A., T. N. Petney, and R. G. Robbins. 2020.** Ixodidae (Acari: Ixodoidea): descriptions and redescriptions of all known species from 1758 to December 31, 2019. Zootaxa 4871: 1–322.

**Integrated Taxonomic Information System (ITIS).** Taxonomic data accessed 11/2021–4/2022, from the ITIS on-line database. [www.itis.gov](http://www.itis.gov/), [CC0](https://creativecommons.org/publicdomain/zero/1.0/legalcode), <https://doi.org/10.5066/F7KH0KBK>.

**Kembel, S.W., P.D. Cowan, M.R. Helmus, W.K. Cornwell, H. Morlon, D.D. Ackerly, S.P. Blomberg, and C.O. Webb. 2010.** Picante: R tools for integrating phylogenies and ecology. Bioinformatics. 26: 1463–1464.

**Mathison, B. A., and S. G. H. Sapp**. **2021**. An annotated checklist of the eukaryotic parasites of humans, exclusive of fungi and algae. Zookeys. 1069: 1–313.

**Upham, N. S., J. A. Esselstyn, and W. Jetz**. **2019**. Inferring the mammal tree: species-level sets of phylogenies for questions in ecology, evolution, and conservation. PLoS Biol. 17: e3000494. https://doi.org/10.1371/journal.pbio.3000494. Data Dryad: https://doi.org/10.5061/dryad.tb03d03

**Yang, L. H., and B. A. Han**. **2018**. Data-driven predictions and novel hypotheses about zoonotic tick vectors from the genus *Ixodes*. BMC Ecol. 18: 1–6.