How georeferencing error is dealt with in the literature

Key words used: georeferencing of specimens

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| Reference | Method of dealing with geospatial error |
| Velásquez-Tibatá, J., Graham, C. H. and Munch, S. B. (2016) ‘Using measurement error models to account for georeferencing error in species distribution models’, Ecography. John Wiley & Sons, Ltd (10.1111), 39(3), pp. 305–316. doi: 10.1111/ecog.01205. | Bayesian logistic regression with measurement error |
| Feeley, K. J. and Silman, M. R. (2010) ‘Modelling the responses of Andean and Amazonian plant species to climate change: the effects of georeferencing errors and the importance of data filtering’, *Journal of Biogeography*. John Wiley & Sons, Ltd (10.1111), 37(4), pp. 733–740. doi: 10.1111/j.1365-2699.2009.02240.x. | Data filtering (removing data before modelling if it does not meet minimum requirements (which can be quite strict) of quality. |
| Guralnick, R. P., Wieczorek, J., Beaman, R., and Hijmans, R. J., (2006) ‘BioGeomancer: Automated Georeferencing to Map the World’s Biodiversity Data’, PLoS Biology. Public Library of Science, 4(11), p. e381. doi: 10.1371/journal.pbio.0040381. | Point-radius method |
| Beaman, R. and Conn, B. (2003) ‘Automated geoparsing and georeferencing of Malesian collection locality data’, Telopea, 10(1), pp. 43–52. doi: 10.7751/telopea20035604. | None used, but state error analysis is needed |
| Garcia-Milagros, E. and Funk, V. A. (2010) ‘data: Improving the use of information from museum specimens: Using Google Earth© to georeference Guiana Shield specimens in the US National Herbarium’, Frontiers of Biogeography, 2(3). doi: 10.21425/f5fbg12348. | Gazetteer coordinates as a measure of uncertainty, Point-radius |
| Funk, V. A., Zermoglio, M. F. and Nasir, N. (1999) ‘Testing the use of specimen collection data and GIS in biodiversity exploration and conservation decision making in Guyana’, Biodiversity and Conservation. Kluwer Academic Publishers, 8(6), pp. 727–751. doi: 10.1023/A:1008877222842. | None used |
| Rivers, M. C, Taylor, L., Brummitt, N. A., Meagher, T. R., Roberts, D. L. and Lughadha, E. N. (2011) ‘How many herbarium specimens are needed to detect threatened species?’, Biological Conservation. Elsevier, 144(10), pp. 2541–2547. doi: 10.1016/J.BIOCON.2011.07.014. | None used |
| Kozak, K. H. and Wiens, J. J. (2007) ‘Climatic zonation drives latitudinal variation in speciation mechanisms’, Proceedings of the Royal Society B: Biological Sciences. The Royal SocietyLondon, 274(1628), pp. 2995–3003. doi: 10.1098/rspb.2007.1106. | None used – say all georefecences were from systematic studies with ref being taken from original authors (so probably lat long coords). |
| Stein, B. R. and Wieczorek, J. R. (2004) ‘Mammals of the World: MaNIS as an example of data integration in a distributed network environment’, Biodiversity Informatics, 1(0). doi: 10.17161/bi.v1i0.7. | Point-radius method |
| Rowe, R. J. (2005) ‘Elevational gradient analyses and the use of historical museum specimens: a cautionary tale’, Journal of Biogeography. John Wiley & Sons, Ltd (10.1111), 32(11), pp. 1883–1897. doi: 10.1111/j.1365-2699.2005.01346.x | Post-hoc 3-dimensional georeferencing (point radius but including a *z* parameter as far as I can tell). |
| Brummitt, N., Bachman, S. and Moat, J. (2008) ‘Applications of the IUCN Red List: towards a global barometer for plant diversity’, Endangered Species Research, 6(2), pp. 127–135. doi: 10.3354/esr00135. | None specified, alludes to error being computed for georeferences |
| Särkinen, T., Iganci, J. RV., Linares-Palomino, R., Simon, M. F., and Prado, D. E. (2011) ‘Forgotten forests - issues and prospects in biome mapping using Seasonally Dry Tropical Forests as a case study’, BMC Ecology. BioMed Central, 11(1), p. 27. doi: 10.1186/1472-6785-11-27. | Data filtering (they allude to georef errors but don’t incorporate into study) |
| Soberón, J. M., Llorente, J. B. and Oñate, L. (2000) ‘The use of specimen-label databases for conservation purposes: an example using Mexican Papilionid and Pierid butterflies’, Biodiversity and Conservation. Kluwer Academic Publishers, 9(10), pp. 1441–1466. doi: 10.1023/A:1008987010383. | No formal method, localities were assigned to be 1 min arc (transating to pixels of 1.1km a side) |
| Riordan, E. C. and Rundel, P. W. (2009) ‘Modelling the distribution of a threatened habitat: the California sage scrub’, Journal of Biogeography. John Wiley & Sons, Ltd (10.1111), 36(11), pp. 2176–2188. doi: 10.1111/j.1365-2699.2009.02151.x. | Data filtering (I think, they basically eyeballed it to remove any obvious errors in data entry) |
| Rivers, M. C., Bachman, S. P., Meagher, T. R., Lughadha E. N., Brummitt, N. A.. (2010) ‘Subpopulations, locations and fragmentation: applying IUCN red list criteria to herbarium specimen data’, Biodiversity and Conservation. Springer Netherlands, 19(7), pp. 2071–2085. doi: 10.1007/s10531-010-9826-9. | None mentioned, assuming that as with many of these if the authors are not conducting the georeferencing someone else has done so probably using point-radius as that is the most widely used method |
| Hopkins, M. J. G. (2007) ‘Modelling the known and unknown plant biodiversity of the Amazon Basin’, Journal of Biogeography. John Wiley & Sons, Ltd (10.1111), 34(8), pp. 1400–1411. doi: 10.1111/j.1365-2699.2007.01737.x. | No method described for georef’d points, but say that uncertainty was +-50km (this was used as a reason for not using a particular model) |
| Roberts, D. L., Taylor, L. and Joppa, L. N. (2016) ‘Threatened or Data Deficient: assessing the conservation status of poorly known species’, Diversity and Distributions. Edited by J. Beggs. John Wiley & Sons, Ltd (10.1111), 22(5), pp. 558–565. doi: 10.1111/ddi.12418. | None used. Data was filtered |
| Barros, F. S. M., Siqueira, M. F. de and Costa, D. P. da (2012) ‘Modeling the potential geographic distribution of five species of Metzgeria Raddi in Brazil, aiming at their conservation’, The Bryologist. American Bryological and Lichenological Society, pp. 341–349. doi: 10.2307/23321035. | Arbitrary precision of 5 arc minutes given to all localities |
| Buckley, L. B. (2008) ‘Linking traits to energetics and population dynamics to predict lizard ranges in changing environments.’, The American naturalist. The University of Chicago Press , 171(1), pp. E1–E19. doi: 10.1086/523949. | None mentioned, however data was from GBIF and herpnet (GBIF definitely uses point-radius for its data, but as the author makes no mention, I assume they haven’t included error) |
| GBIF <https://www.gbif.org/> | Used point-radius method when post-hoc georeferencing |
| Foley, D. H., Weitzman, A. L., Miller, S. E., Faran, M. E., Rueda, L. M., and Wilkerson, R. C. (2007) ‘The value of georeferenced collection records for predicting patterns of mosquito species richness and endemism in the Neotropics’, Ecological Entomology. John Wiley & Sons, Ltd (10.1111), 0(0), pp. 071203162814003-??? doi: 10.1111/j.1365-2311.2007.00927.x. | None used. Precision was either of lat long or 1km – 100m depending on if MGRS coords were used or specimens were re-georef’d |
| McCormack, J. E., Zellmer, A. J. and Knowles, L. L. (2010) ‘Does niche divergence accompany allopatric divergence in Aphelocoma Jays as predicted under ecological speciation?: Insights from tests with niche models’, Evolution. John Wiley & Sons, Ltd (10.1111), 64(5), pp. 1231–1244. doi: 10.1111/j.1558-5646.2009.00900.x. | None mentioned. Some data was direct observation recorded with a GPS logger, but museum specimens were used as well |
| Linder, P. H., Antonelli, A., Humphreys, A. M., Pirie, M. D., and Wüest, R. O. (2013) ‘What determines biogeographical ranges? Historical wanderings and ecological constraints in the danthonioid grasses’, Journal of Biogeography. Edited by R. Ladle. John Wiley & Sons, Ltd (10.1111), 40(5), pp. 821–834. doi: 10.1111/jbi.12070. | None mentioned, GBIF was used for part of the dataset so some point radius possibly |
| Duursma, D. E., Gallagher, R. V., Roger, E., Hughes, L., Downey, P. O., and Leishman, M. R. (2013) ‘Next-Generation Invaders? Hotspots for Naturalised Sleeper Weeds in Australia under Future Climates’, PLoS ONE. Edited by P. Adam. Public Library of Science, 8(12), p. e84222. doi: 10.1371/journal.pone.0084222. | None mentioned. GBIF used, but also georeferenced themselves, do not mention error/uncertainty |
| Chang, C.S., Chang, K.S., Ahn, Y.S. and Kim, H. (2012) ‘Georeferencing of primary species occurrence data and necessity of data quality control-a case study of two varieties of Ox-Knee, Achyranthes bidentata Blume’, Journal of Korean Society of Forest Science, 101(2), pp. 185–194. Available at: <http://www.koreascience.or.kr/article/JAKO201219069094059.page>. | Yes, seems like point-radius but a little difficult to tell |
| Gómez-Mendoza, L. and Arriaga, L. (2007) ‘Modeling the Effect of Climate Change on the Distribution of Oak and Pine Species of Mexico’, Conservation Biology. John Wiley & Sons, Ltd (10.1111), 21(6), pp. 1545–1555. doi: 10.1111/j.1523-1739.2007.00814.x. | None mentioned – as with many, if the author isn’t doing the georefing they don’t seem to think about uncertainty |
| Anacker, B. L. and Strauss, S. Y. (2014) ‘The geography and ecology of plant speciation: range overlap and niche divergence in sister species’, Proceedings of the Royal Society B: Biological Sciences. The Royal Society, 281(1778), p. 20132980. doi: 10.1098/rspb.2013.2980. | None used – applied a 10km buffer as range estimation, but no error added to geographical point |
| Neufeld, D. L., Guralnick, R. P., Glaubitz, R. and Allen, J. R. (2003) ‘Museum Collections Data and Online Mapping Applications’, https://doi.org/10.1659/0276-4741(2003)023[0334:MCDAOM]2.0.CO;2. International Mountain Society, 23(4), pp. 334–337. doi: 10.1659/0276-4741(2003)023[0334:MCDAOM]2.0.CO;2. | None used |
| Campbell, T. L., Lewis, P. J. and Williams, J. K. (2011) ‘Analysis of the modern distribution of South African Gerbilliscus (Rodentia: Gerbillinae) with implications for Plio-Pleistocene palaeoenvironmental reconstruction’, South African Journal of Science. Academy of Science of South Africa, 107(1/2), pp. 1–7. doi: 10.4102/sajs.v107i1/2.497. | None used – some data was accepted to have error as was georef’d using older mapping systems, but still only used point data |
| Boumans, L. (2011) ‘The Plecoptera Collection At The Natural History Museum In Oslo’, Illiesia, 7(25), pp. 280–290. Available at: <http://www2.pms-lj.si/illiesia/papers/Illiesia07-25.pdf>. | None used – they simply say they georef’d the specimens as best they could to a coord. |
| Droissart, V., Hardy, O. J., Sonké, B., Dahdouh-Guebas, F., and Stévart, T. (2012) ‘Subsampling Herbarium Collections to Assess Geographic Diversity Gradients: A Case Study with Endemic Orchidaceae and Rubiaceae in Cameroon’, Biotropica. John Wiley & Sons, Ltd (10.1111), 44(1), pp. 44–52. doi: 10.1111/j.1744-7429.2011.00777.x. | Filtered data to ‘precise’ only (accurate to 10km) |
| Miller, J. S., Krupnick, G. A., Stevens, H., Porter-Morgan, H., Boom, B., Acevedo-Rodríguez, P., Ackerman, J., Kolterman, D., Santiago, E., Torres, C., and Velez, J. (2013) ‘Toward Target 2 of the Global Strategy for Plant Conservation: An Expert Analysis of the Puerto Rican Flora to Validate New Streamlined Methods for Assessing Conservation Status’, Annals of the Missouri Botanical Garden. Missouri Botanical Garden Press, 99(2), pp. 199–205. doi: 10.3417/2011121. | None mentioned |
| Tobler, M., Honorio, E., Janovec, J., and Reynel, C.  (2007) ‘Implications of collection patterns of botanical specimens on their usefulness for conservation planning: an example of two neotropical plant families (Moraceae and Myristicaceae) in Peru’, Biodiversity and Conservation. Kluwer Academic Publishers, 16(3), pp. 659–677. doi: 10.1007/s10531-005-3373-9. | Manually checked coords to reduce error (error between 1-100km reported in this paper, no formal method of adding uncertainty mentioned) |
| DeWalt, R. E., Cao, Y., Hinz, L., and Tweddale, T. (2009) ‘Modelling of historical stonefly distributions using museum specimens’, Aquatic Insects. Taylor & Francis , 31(sup1), pp. 253–267. doi: 10.1080/01650420903024249. | None used |
| Syfert, M. M.. Serbina, L., Burckhardt, D., Knapp, S., and Percy, D. M. (2017) ‘Emerging New Crop Pests: Ecological Modelling and Analysis of the South American Potato Psyllid Russelliana solanicola (Hemiptera: Psylloidea) and Its Wild Relatives’, PLOS ONE. Edited by X.-Q. Li. Public Library of Science, 12(1), p. e0167764. doi: 10.1371/journal.pone.0167764. | Error calculated, don’t say how. Give a median value of 8km and range of 500m to over 100km |
| Strenghts and weaknesses of museum and Guralnick, R. and Van Cleve, J. (2005) ‘Strengths and weaknesses of museum and national survey data sets for predicting regional species richness: comparative and combined approaches’, Diversity and Distributions. John Wiley & Sons, Ltd (10.1111), 11(4), pp. 349–359. doi: 10.1111/j.1366-9516.2005.00164.x. | Points to methods of data prep in supplementary materials, which are not available (broken web link) |
| Arrigo, N., Therrien, J., Anderson, C. L., Windham, M. D., Haufler, C. H., and Barker, M. S. (2013) ‘A total evidence approach to understanding phylogenetic relationships and ecological diversity in Selaginella subg. Tetragonostachys’, American Journal of Botany. John Wiley & Sons, Ltd, 100(8), pp. 1672–1682. doi: 10.3732/ajb.1200426. | None used – discarded imprecise georefs (or gave them new coords, no mention of error) |
| Boakes, E. H., McGowan, P. J. K., Fuller, R. A., Chang-qing, D., Clark, N. E., O'Connor, K., and Mace, G. M. (2010) ‘Distorted Views of Biodiversity: Spatial and Temporal Bias in Species Occurrence Data’, PLoS Biology. Public Library of Science, 8(6), p. e1000385. doi: 10.1371/journal.pbio.1000385. | A bewildering variety of methods used – accuracy to 1degree, or 10minutes or if description matched two or more places a midpoint was taken, so long as it was accurate to 1degree. Data was then required to meet arbitrary requirements such as that it was within a reasonable distance of the species known range (what this constitutes is not specified) |
| Crawford, P. H. C. and Hoagland, B. W. (2009) ‘Can herbarium records be used to map alien species invasion and native species expansion over the past 100 years?’, Journal of Biogeography. John Wiley & Sons, Ltd (10.1111), 36(4), pp. 651–661. doi: 10.1111/j.1365-2699.2008.02043.x. | Georef’d to township (93.3km2) resolution (present or absent essentially) |
| Zeilinger, A. R., Rapacciuolo, G., Turek, D., Oboyski, P. T., Almeida, R. P. P., and Roderick, G. K. (2017) ‘Museum specimen data reveal emergence of a plant disease may be linked to increases in the insect vector population’, Ecological Applications. John Wiley & Sons, Ltd, 27(6), pp. 1827–1837. doi: 10.1002/eap.1569. | Point-radius method! |
| Lozier, J. D., Aniello, P. and Hickerson, M. J. (2009) ‘Predicting the distribution of Sasquatch in western North America: anything goes with ecological niche modelling’, Journal of Biogeography. John Wiley & Sons, Ltd (10.1111), 36(9), pp. 1623–1627. doi: 10.1111/j.1365-2699.2009.02152.x. | Georef’d to place name only (presumably Yellowstone has equal meaning here to Medstead (a small village), so resolution varies wildly). |
| Cason, M. M., Baltensperger, A. P., Booms, T. L., Burns, J. J., and Olson, L. E. (2016) ‘Revised distribution of an Alaskan endemic, the Alaska Hare (Lepus othus), with implications for taxonomy, biogeography, and climate change’, Arctic Science. NRC Research Press http://www.nrcresearchpress.com, 2(2), pp. 50–66. doi: 10.1139/as-2015-0019. | Point-radius (by the sound of it, “assigned coords and error radii”) |
| Phillips, S. J. and Dudík, M. (2008) ‘Modeling of species distributions with Maxent: new extensions and a comprehensive evaluation’, Ecography. John Wiley & Sons, Ltd (10.1111), 31(2), pp. 161–175. doi: 10.1111/j.0906-7590.2008.5203.x. | A machine learning method of distribution probability, does not seem to deal with initial error in georef’s, but many papers use this method |
| Zhang, M.-G., Zhou, Z-K., Chen, W-Y., Cannon, C. H., Raes, N., and Slik, J. W. F. (2013) ‘Major declines of woody plant species ranges under climate change in Yunnan, China’, Diversity and Distributions. Edited by B. Bradley. John Wiley & Sons, Ltd (10.1111), 20(4), pp. 405–415. doi: 10.1111/ddi.12165. | Ref’d to five arc minutes, as this was resolution of climate data |
| Kozak, K. H., Graham, C. H. and Wiens, J. J. (2008) ‘Integrating GIS-based environmental data into evolutionary biology’, Trends in Ecology & Evolution. Elsevier Current Trends, 23(3), pp. 141–148. doi: 10.1016/J.TREE.2008.02.001. | None mentioned |
| Schmidt, M., Kreft, H., Thiombiano, A. and Zizka, G. (2005) ‘Herbarium collections and field data-based plant diversity maps for Burkina Faso’, Diversity and Distributions. John Wiley & Sons, Ltd (10.1111), 11(6), pp. 509–516. doi: 10.1111/j.1366-9516.2005.00185.x. | 5-10km if older record made using gazetteer, precise location from newer GPS ref’d specimens |
| Gutiérrez, E. E., Boria, R. A. and Anderson, R. P. (2014) ‘Can biotic interactions cause allopatry? Niche models, competition, and distributions of South American mouse opossums’, Ecography. John Wiley & Sons, Ltd (10.1111), 37(8), pp. 741–753. doi: 10.1111/ecog.00620. | Error is acknowledged, but how it was calculated is not specified. I think, based on the supplementary material and figures, point-radius or an equivalent was used. |
| Donoso, D. A., Salazar, F., Maza, F., Cárdenas, R. E., and Dangles, O. (2009) ‘Diversity and distribution of type specimens deposited in the Invertebrate section of the Museum of Zoology QCAZ, Quito, Ecuador’, Annales de la Société entomologique de France (N.S.). Taylor & Francis Group, 45(4), pp. 437–454. doi: 10.1080/00379271.2009.10697628. | Point radius, follows methods outlined in Wieczorek *et al.,* (2004), categorises description data into nine bins depending on certainty/quality of description |
| Droissart, V. Sonké, B., Hardy, O. J., Simo, M., Taedoumg, H., Nguembou, C. K., and Stévart, T. (2011) ‘Do plant families with contrasting functional traits show similar patterns of endemism? A case study with Central African Orchidaceae and Rubiaceae’, Biodiversity and Conservation. Springer Netherlands, 20(7), pp. 1507–1531. doi: 10.1007/s10531-011-0042-z. | None used – imprecise data was discarded, what counted as imprecise isn’t mentioned, however they do mention that spp were grouped into classes based on distance from the ocean at 1degree, more than 2-3degree and more than 3degree classes. In this case 1deg corresponds to 111km |
| Beentje, H.J., Luke, W.R.Q., Ghazanfar, S.A. and Moat, J. (2006) ‘Restricted range endemism in East African plants’, Taxonomy and ecology of African plants, their conservation and sustainable use. Proceedings of the 17th AETFAT Congress, pp. 229–245. | None mentioned |
| McElwain, J. C. (2004) ‘Climate-independent paleoaltimetry using stomatal density in fossil leaves as a proxy for CO2 partial pressure’, Geology. GeoScienceWorld, 32(12), p. 1017. doi: 10.1130/G20915.1. | None mentioned |
| Davenport, T. R. B., De Luca, D. W., Bracebridge, C. E., Machaga, S. J., Mpunga, N. E., Kibure, O., and Abeid, Y. S. (2010) ‘Diet and feeding patterns in the kipunji (Rungwecebus kipunji) in Tanzania’s Southern Highlands: a first analysis’, Primates. Springer Japan, 51(3), pp. 213–220. doi: 10.1007/s10329-010-0190-x. | None mentioned – modern GPS loggers used for georefing so little error on the points I think |
| Bendiksby, M., Mazzoni, S., Jørgensen, M. H., Halvorsen, R., and Holien, H. (2014) ‘Combining genetic analyses of archived specimens with distribution modelling to explain the anomalous distribution of the rare lichen Staurolemma omphalarioides: long-distance dispersal or vicariance?’, Journal of Biogeography. Edited by P. Pearman. John Wiley & Sons, Ltd (10.1111), 41(11), pp. 2020–2031. doi: 10.1111/jbi.12347. | None mentioned |
| Stigall, A. L., Bauer, J. E. and Brame, H. M. R. (2014) ‘The digital Atlas of Ordovician life: Digitizing and mobilizing data for paleontologists and the public’, Estonian Journal of Earth Sciences, 63(4), pp. 312–316. doi: 10.3176/earth.2014.36. | Point radius method (I think, as it says it follows Wieczorek & Chapman, 2006) |
| Craven, P. and Vorster, P. (2006) ‘Patterns of plant diversity and endemism in Namibia’, Bothalia, 36(2), pp. 175–189. doi: 10.4102/abc.v36i2.360. | Quarter degree square system of Edwards and Leistner (1971) |
| Carlson, C. J., Burgio, K. R., Dougherty, E. R., Phillips, A. J., Bueno, V. M., Clements, C. F., Castaldo, G., Dallas, T. A., Cizauskas, C. A., Cumming, G. S., Doña, J., Harris, N. C., Jovani, R., Mironov, S., Muellerklein, O. C., Proctor, H. C., and Getz, W. M. (2017) ‘Parasite biodiversity faces extinction and redistribution in a changing climate’, Science Advances. American Association for the Advancement of Science, 3(9), p. e1602422. doi: 10.1126/sciadv.1602422. | Probably point-radius ( Wieczorek & Chapman, 2006) |
| Sidlauskas, B. L. and Vari, R. P. (2012) ‘Diversity and distribution of anostomoid fishes (Teleostei: Characiformes) throughout the Guianas’, Cybium, 36(1), pp. 71–103. | None mentioned |
| Gotelli, N. J., Chao, A., Colwell, R. K., Hwang, W-H., and Graves, G. R. (2012) ‘Specimen-Based Modeling, Stopping Rules, and the Extinction of the Ivory-Billed Woodpecker’, Conservation Biology. John Wiley & Sons, Ltd (10.1111), 26(1), pp. 47–56. doi: 10.1111/j.1523-1739.2011.01715.x. | None mentioned |
| Rissler, L. J. and Apodaca, J. J. (2007) ‘Adding More Ecology into Species Delimitation: Ecological Niche Models and Phylogeography Help Define Cryptic Species in the Black Salamander (Aneides flavipunctatus)’, Systematic Biology. Edited by J. Weins. Narnia, 56(6), pp. 924–942. doi: 10.1080/10635150701703063. | None mentioned |
| Martin, M. D. and Omland, K. E. (2011) ‘Environmental Niche Modeling Reveals Climatic Differences among Breeding Ranges of Orchard Oriole Subspecies’, The American Midland Naturalist, 166(2), pp. 404–414. | Point-radius |
| Matthews, E. R. and Mazer, S. J. (2016) ‘Historical changes in flowering phenology are governed by temperature × precipitation interactions in a widespread perennial herb in western North America’, New Phytologist. John Wiley & Sons, Ltd (10.1111), 210(1), pp. 157–167. doi: 10.1111/nph.13751. | None mentioned |
| Molgo, I. E., Soltis, D. E. and Soltis, P. S. (2017) ‘Cytogeography of Callisia section Cuthbertia (Commelinaceae).’, Comparative cytogenetics. Pensoft Publishers, 11(4), pp. 553–577. doi: 10.3897/CompCytogen.v11i4.11984. | None mentioned |
| Wehr, J. D., Stancheva, R., Truhn, K., andSheath, R. G. (2013) ‘Discovery of the Rare Freshwater Brown Alga Pleurocladia lacustris (Ectocarpales, Phaeophyceae) in California Streams’, Western North American Naturalist. Monte L. Bean Life Science Museum, Brigham Young University, 73(2), pp. 148–157. doi: 10.3398/064.073.0204. | None mentioned |
| McAllister, C. A. et al. (2019) ‘Specimen-based analysis of morphology and the environment in ecologically dominant grasses: the power of the herbarium’, Philosophical Transactions of the Royal Society B: Biological Sciences. The Royal Society, 374(1763), p. 20170403. doi: 10.1098/rstb.2017.0403. | None mentioned – climatic data associted with locality was at the 30-arc second resolution, so might be a proxy in some cases |
| Andrew, M. E., Wulder, M. A., Coops, N. C., and Baillargeon, G. (2012) ‘Beta-diversity gradients of butterflies along productivity axes’, Global Ecology and Biogeography. John Wiley & Sons, Ltd (10.1111), 21(3), pp. 352–364. doi: 10.1111/j.1466-8238.2011.00676.x. | None mentioned – used cbif (canadian biodiversity information facility) so may have used data that had point-radius error, but if so no mention of incorporating it into the study is made |
| Graham, M. R., Jaeger, J. R., Prendini, L., and Riddle, B. R. (2013) ‘Phylogeography of the Arizona hairy scorpion (Hadrurus arizonensis) supports a model of biotic assembly in the Mojave Desert and adds a new Pleistocene refugium’, Journal of Biogeography. Edited by M. McGeoch. John Wiley & Sons, Ltd (10.1111), 40(7), pp. 1298–1312. doi: 10.1111/jbi.12079. | Alludes to standard georeferencing techniques and states anything with error greater than 5km was dropped from modelling, however no indication of what ‘standard’ technique used actually is. MAXENT is also used, however I do not believe this in of itself deals with georef errors |
| Stockwell, D. R. B., Beach, J. H., Stewart, A., Vorontsov, G., Vieglais, D., and Pereira, R. S. (2006) ‘The use of the GARP genetic algorithm and Internet grid computing in the Lifemapper world atlas of species biodiversity’, Ecological Modelling. Elsevier, 195(1–2), pp. 139–145. doi: 10.1016/J.ecolmodel.2005.11.016. | None mentioned – pulls georef’d records from a wide variety of sources it seems. Error not thought about in this context |
| Graham, C. H., Elith, J., Hijmans, R. J., Guisan, A., Townsend P. A., and Loiselle, B. A. (2007) ‘The influence of spatial errors in species occurrence data used in distribution models’, Journal of Applied Ecology. John Wiley & Sons, Ltd (10.1111), 45(1), pp. 239–247. doi: 10.1111/j.1365-2664.2007.01408.x. | Demonstrate that MaxEnt and boosted regression trees are both robust to moderate geographical error, interestingly |
| McGowan, A. and Kiessling, W. (2013) ‘Using abundance data to assess the relative role of sampling biases and evolutionary 2 radiations in Upper Muschelkalk ammonoids’, Acta Palaeontologica Polonica. Institute of Paleobiology, Polish Academy of Sciences, 58(3), pp. 561–572. doi: 10.4202/app.2010.0040. | Resolution of 10km – I’m guessing point radius as BioGeoMancer used. Justification used of 10km is broadly considered acceptable in ecological studues, and 100km in paleontology |
| Henebry, G., Putz, B. C. and Merchant, J. W. (2001) ‘Modeling Reptile and Amphibian Range Distributions from Species Occurrences and Landscape Variables’, GAP Analysis Bulletin No. 10, 10, pp. 22–26. Available at: https://digitalcommons.unl.edu/usgspubs/30 (Accessed: 5 August 2019). | Error of one quarter section (65 ha) if specimens had to be georef’d. Point data was used for the other previously ref’d specimens |
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| Sandall, E. and Deans, A. (2018) ‘Temporal differentiation in environmental niche modeling of Nearctic narrow-winged damselflies (Odonata: Coenagrionidae)’, PeerJ Preprints, pp. 0–14. doi: 10.7287/peerj.preprints.27261. | Point radius (resolution to 30arcseconds) |
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| Wilkin, P., Hladik, A., Weber, O., Hladik, C.M. and Jeannoda, V., (2009) ‘Dioscorea orangeana (Dioscoreaceae), a new and threatened species of edible yam from northern Madagascar’, Kew Bulletin. Springer-Verlag, 64(3), pp. 461–468. doi: 10.1007/s12225-009-9126-2. | None mentioned – I think GPS handloggers were used here |
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