

# Home Ranges

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## Packages

- **adehabitatHR** - early package for home range estimation (KDE, MCP) (Calenge 2007)
- **ctmm** - mostly for AKDE home range estimation (Calabrese, Fleming, and Gurarie 2016)
- **amt** - this package was originally for SSFs but has recent functionality for home ranges (Signer and Fieberg 2021)

## Home range approaches

### Kernel density estimation (KDE)

Worton, B. J. (1989). **Kernel methods for estimating the utilization distribution in home-range studies**. *Ecology*, 70(1), 164–168. <https://doi.org/10.2307/1938423>

### Autocorrelated kernel density estimation (AKDE)

Fleming, C. H., Fagan, W. F., Mueller, T., Olson, K. A., Leimgruber, P., & Calabrese, J. M. (2015). **Rigorous home range estimation with movement data: a new autocorrelated kernel density estimator**. *Ecology*, 96(5), 1182–1188. <https://doi.org/10.1890/14-2010.1>

Silva, I., Fleming, C. H., Noonan, M. J., Alston, J., Folta, C., Fagan, W. F., & Calabrese, J. M. (2022). **Autocorrelation-informed home range estimation: A review and**

**practical guide.** *Methods in Ecology and Evolution* / British Ecological Society, 13(3), 534–544. <https://doi.org/10.1111/2041-210x.13786>

### **Brownian bridge approaches (BBMM and dBBMM)**

Horne, J. S., Garton, E. O., Krone, S. M., & Lewis, J. S. (2007). **Analyzing animal movements using Brownian bridges.** *Ecology*, 88(9), 2354–2363. <https://doi.org/10.1890/06-0957.1>

Kranstauber, B., Kays, R., Lapoint, S. D., Wikelski, M., & Safi, K. (2012). **A dynamic Brownian bridge movement model to estimate utilization distributions for heterogeneous animal movement.** *The Journal of Animal Ecology*, 81(4), 738–746. <https://doi.org/10.1111/j.1365-2656.2012.01955.x>

### **Conceptual considerations**

**Range vs occurrence distributions** Alston, J. M., Fleming, C. H., Noonan, M. J., Tucker, M. A., Silva, I., Foltá, C., Akre, T. S. B., Ali, A. H., Belant, J. L., Beyer, D., Blaum, N., Böhning-Gaese, K., de Paula, R. C., Dekker, J., Drescher-Lehman, J., Farwig, N., Fichtel, C., Fischer, C., Ford, A. T., ... Calabrese, J. M. (2022). **Clarifying space use concepts in ecology: range vs. occurrence distributions.** In bioRxiv (p. 2022.09.29.509951). <https://doi.org/10.1101/2022.09.29.509951>

### **References**

- Calabrese, Justin M, Chris H Fleming, and Eliezer Gurarie. 2016. “Ctmm: An r package for analyzing animal relocation data as a continuous-time stochastic process.” *Methods in Ecology and Evolution* / *British Ecological Society* 7 (September): 1124–32. <https://doi.org/10.1111/2041-210x.12559>.
- Calenge, Clément. 2007. “Exploring Habitat Selection by Wildlife with adehabitat.” *Journal of Statistical Software* 22 (September): 1–19. <https://doi.org/10.18637/jss.v022.i06>.
- Signer, Johannes, and John R Fieberg. 2021. “A fresh look at an old concept: home-range estimation in a tidy world.” *PeerJ* 9 (March): e11031. <https://doi.org/10.7717/peerj.11031>.