

# crawl: An R Package for Modeling Animal Movement from Satellite Telemetry Data

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2015 NMFS PST Mini-Symposium  
November 18, 2015



# R Packages: Low-Level Software Tools for Fisheries Management

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# The Problems

- NMFS science centers collect a large amount of animal telemetry data every year
- Used to determine where animals spend time in various behaviors
- Predictions have to be made for times with no observed location
- Must be done for many animals
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## correlated random walk library of R Functions

- `crawl` is an add-on package for the R statistical environment
- Contains a collection of functions and objects that allow a user to fit continuous-time correlated random walk models to telemetry data
- As part of the PST project:
  - updated to use compiled C++ code for computationally efficient model fitting
  - Detailed example documentation added (vignette)
  - Web-based app included for data pre-processing (Shiny app)
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- One of the most popular computing languages in the world
- R is an interactive high-level computing language  
(No compiling source code)
- Users can customize R with packages
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- Allows an complex analysis to be repeated / altered on demand
- Scientists can easily share newly developed statistical methodology
- Provides avenues for documentation and reproducibility
- Problem:
  - Produces low-level tools
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A brief intermission

A crawl demo

## agTrend: another R package from NMML

- Estimate abundance trends for aggregations of survey sites
- E.g, abundance trend of Western Aleutian Steller sea lions
- Problem:
  - Not all sites are surveyed in a given year
  - How can abundance be aggregated over all sites each year?
- Solution:
  - Bayesian nonparametric regression analysis
  - A relatively complex analysis!
- Package constructed directly to satisfy management needs
- Analysis repeatable with on-demand aggregation groups  
e.g., trends for all rookeries that start with the letter S!

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# R Packages by NMML/AFSC

## CRAN Mid-level production packages

Package	Analysis of ...
crawl	Telemetry data
agTrend	Population trends
stocc	Spatial occupancy data
marked	Mark-recapture data
RMark	Mark-recapture data
DSpat	Line transect data
hierachicalDS	Line transect data
mrds	Line transect data

## github Low-level or development packages

<https://github.com/NMML>

# Conclusion

- R provides a way to bundle complex analysis into tidy packages
- Can create demos, apps, long-form documentation
- R is platform independent
- Multiple locations to host packages: CRAN (official) or GitHub
- Still requires use of R console
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Questions?

