

| Model (Red means implemented in RMark)  | Code              | RMark Example               | Parameters |         |        |     |         |        |    |    |   |    |    |  |
|---|-------------------|-----------------------------|------------|---------|--------|-----|---------|--------|----|----|---|----|----|--|
| Live Recaptures (CJS)   | CJS               | ?dipper; ?example.data      | Phi        | p       |        |     |         |        |    |    |   |    |    |  |
| Dead Recoveries   | Recovery          | ?brownie                    | S          | r       |        |     |         |        |    |    |   |    |    |  |
| Both Live and Dead Encounters -- Burnham  | Burnham           | ?Burnham                    | S          | p       | r      | F   |         |        |    |    |   |    |    |  |
| Known Fate  | Known             | ?blackduck                  | S          |         |        |     |         |        |    |    |   |    |    |  |
| Closed Population Estimation  | Closed            | ?edwards.eberhardt          | p          | c       | f0     |     |         |        |    |    |   |    |    |  |
| BTO Dead Recoveries and Unknown Ringings  | BTO               |                             | S          |         |        |     |         |        |    |    |   |    |    |  |
| Robust Design with Closed Population Estimation   | Robust            | ?robust                     | S          | Gamma'' | Gamma' | p   | c       | f0     |    |    |   |    |    |  |
| Both Live and Dead Encounters -- Barker   | Barker            |                             | S          | p       | r      | R   | R'      | F      | F' |    |   |    |    |  |
| Multi-state with Live Recaptures  | Multistrata       |                             | S          | p       | Psi    |     |         |        |    |    |   |    |    |  |
| Brownie et al. Dead Recoveries  | Brownie           | ?brownie                    | S          | f       |        |     |         |        |    |    |   |    |    |  |
| Jolly-Seber Lambda -- Burnham   | Jolly             |                             | Phi        | p       | Lambda | N   |         |        |    |    |   |    |    |  |
| Huggins Closed Population Estimation  | Huggins           | ?edwards.eberhardt          | p          | c       |        |     |         |        |    |    |   |    |    |  |
| Robust Design with Huggins' Estimator   | RDHuggins         | ?robust                     | S          | Gamma'' | Gamma' | p   | c       |        |    |    |   |    |    |  |
| Pradel Recruitment Only   | Pradel            |                             | Gamma      | p       |        |     |         |        |    |    |   |    |    |  |
| Pradel Survival and Seniority   | PradSen           |                             | Phi        | p       | Gamma  |     |         |        |    |    |   |    |    |  |
| Pradel Survival and Lambda  | PradLambda        |                             | Phi        | p       | Lambda |     |         |        |    |    |   |    |    |  |
| Pradel Survival and Recruitment   | PradRec           |                             | Phi        | p       | f      |     |         |        |    |    |   |    |    |  |
| Barker Live and Dead with Closed Robust Design  | RDBarker          |                             | S          | r       | R      | R'  | Gamma'' | Gamma' | F  | p  | c | f0 |    |  |
| POPAN   | POPAN             | ?dipper                     | Phi        | p       | pent   | N   |         |        |    |    |   |    |    |  |
| Virtual Population Analysis (VPA)   | VPA               |                             | M          | F       |        |     |         |        |    |    |   |    |    |  |
| Multi-state with Live and Dead Encounters   | MSLiveDead        |                             | S          | p       | Psi    | r   |         |        |    |    |   |    |    |  |
| Closed Captures with Heterogeneity  | HetClosed         | ?edwards.eberhardt          | pi         | p       | f0     |     |         |        |    |    |   |    |    |  |
| Full Closed Captures with Heterogeneity   | FullHet           | ?edwards.eberhardt          | pi         | p       | c      | f0  |         |        |    |    |   |    |    |  |
| Nest Success  | Nest              | ?killdeer; ?mallard         | S          |         |        |     |         |        |    |    |   |    |    |  |
| Huggins' Closed Captures with Heterogeneity   | HugHet            | ?edwards.eberhardt          | pi         | p       |        |     |         |        |    |    |   |    |    |  |
| Huggins' Full Closed Captures with Heterogeneity  | HugFullHet        | ?edwards.eberhardt          | pi         | p       | c      |     |         |        |    |    |   |    |    |  |
| Occupancy Estimation with Detection < 1   | Occupancy         | ?salamander; ?weta          | p          | Psi     |        |     |         |        |    |    |   |    |    |  |
| RD Occupancy Estimation with psi, epsilon.  | RDOccupPE         | ?RDSalamander               | Psi        | Epsilon | p      |     |         |        |    |    |   |    |    |  |
| RD Occupancy Estimation with psi, gamma.  | RDOccupPG         | ?RDOccupancy; ?RDSalamander | Psi        | Gamma   | p      |     |         |        |    |    |   |    |    |  |
| RD Occupancy Estimation with psi(1), gamma, epsilon.  | RDOccupEG         | ?RDSalamander               | Psi        | Epsilon | Gamma  | p   |         |        |    |    |   |    |    |  |
| Link-Barker Jolly-Seber   | LinkBarker        |                             | Phi        | p       | f      |     |         |        |    |    |   |    |    |  |
| Open Robust Design Multi-state  | ORDMS             |                             | S          | Psi     | pent   | Phi | p       |        |    |    |   |    |    |  |
| Closed Robust Design Multi-state  | CRDMS             | ?crdms                      | S          | Psi     | p      | c   | f0      |        |    |    |   |    |    |  |
| Huggins' Closed Robust Design Multi-state   | HCRDMS            |                             | S          | Psi     | p      | c   |         |        |    |    |   |    |    |  |
| Heterogeneity Closed Robust Design Multi-state  | HetRDMS           |                             | S          | Psi     | pi     | p   | f0      |        |    |    |   |    |    |  |
| Full Heterogeneity Closed Robust Design Multi-state   | FHetRDMS          |                             | S          | Psi     | pi     | p   | c       | f0     |    |    |   |    |    |  |
| Huggins' Het. Closed Robust Design Multi-state  | HHetRDMS          |                             | S          | Psi     | pi     | p   |         |        |    |    |   |    |    |  |
| Huggins' Full Het. Closed Robust Design Multi-state   | HFHetRDMS         |                             | S          | Psi     | pi     | p   | c       |        |    |    |   |    |    |  |
| Robust Design with Heterogeneity Estimator  | RDHet             | ?robust                     | S          | Gamma'' | Gamma' | pi  | p       | f0     |    |    |   |    |    |  |
| Robust Design with Full Heterogeneity Estimator   | RDFullHet         |                             | S          | Gamma'' | Gamma' | pi  | p       | c      | f0 |    |   |    |    |  |
| Robust Design with Huggins' Het. Estimator  | RDHHet            |                             | S          | Gamma'' | Gamma' | pi  | p       |        |    |    |   |    |    |  |
| Robust Design with Huggins' Full Het. Estimator   | RDHFHet           |                             | S          | Gamma'' | Gamma' | pi  | p       | c      |    |    |   |    |    |  |
| Barker Live and Dead with Huggins' Robust Design  | RDBarkHug         |                             | S          | r       | R      | R'  | Gamma'' | Gamma' | F  | p  | c |    |    |  |
| Barker Live and Dead with Heterogeneity Robust Design   | RDBarkHet         |                             | S          | r       | R      | R'  | Gamma'' | Gamma' | F  | pi | p | f0 |    |  |
| Barker Live and Dead with Full Het. Robust Design   | RDBarkFHet        |                             | S          | r       | R      | R'  | Gamma'' | Gamma' | F  | pi | p | c  | f0 |  |
| Barker Live and Dead with Huggins' Het. Robust Design   | RDBarkHHet        |                             | S          | r       | R      | R'  | Gamma'' | Gamma' | F  | pi | p |    |    |  |
| Barker Live and Dead with Huggins' Full Het. Robust Design                                    | RDBarkHFHet       |                             | S          | r       | R      | R'  | Gamma'' | Gamma' | F  | pi | p | c  |    |  |
| Lukacs Young Survival from Marked Adults  | LYSMA             |                             | Phi        | p       |        |     |         |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Closed Population Estimation                                   | RDPdGClosed       |                             | Phi        | Gamma   | p      | c   | f0      |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Huggins' Closed Populations                                    | RDPdGHuggins      |                             | Phi        | Gamma   | p      | c   |         |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Closed Captures with Heterogeneity                             | RDPdGHet          |                             | Phi        | Gamma   | pi     | p   | f0      |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Full Closed Captures with Het.                                 | RDPdGFullHet      |                             | Phi        | Gamma   | pi     | p   | c       | f0     |    |    |   |    |    |  |
| Robust Design Pradel Seniority Huggins' Closed Captures with Het.                             | RDPdGHugHet       |                             | Phi        | Gamma   | pi     | p   |         |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Huggins' Full Closed Captures with Het.                        | RDPdGHugFullHet   |                             | Phi        | Gamma   | pi     | p   | c       |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Closed Population Estimation with mis-identification           | RDPdGIDClosed     |                             | Phi        | Gamma   | p      | c   | alpha   | f0     |    |    |   |    |    |  |
| Robust Design Pradel Seniority Huggins' Closed Populations with mis-identification            | RDPdGIDHuggins    |                             | Phi        | Gamma   | p      | c   | alpha   |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Closed Captures with Heterogeneity and mis-identification      | RDPdGIDHet        |                             | Phi        | Gamma   | pi     | p   | alpha   | f0     |    |    |   |    |    |  |
| Robust Design Pradel Seniority Full Closed Captures with Het. and mis-identification          | RDPdGIDFullHet    |                             | Phi        | Gamma   | pi     | p   | c       | alpha  | f0 |    |   |    |    |  |
| Robust Design Pradel Seniority Huggins' Closed Captures with Het. and mis-identification      | RDPdGIDHugHet     |                             | Phi        | Gamma   | pi     | p   | alpha   |        |    |    |   |    |    |  |
| Robust Design Pradel Seniority Huggins' Full Closed Captures with Het. and mis-identification | RDPdGIDHugFullHet |                             | Phi        | Gamma   | pi     | p   | c       | alpha  |    |    |   |    |    |  |
| Robust Design Pradel Lambda Closed Population Estimation                                      | RDPdLClosed       |                             | Phi        | Lambda  | p      | c   | f0      |        |    |    |   |    |    |  |
| Robust Design Pradel Lambda Huggins' Closed Populations                                       | RDPdLHuggins      |                             | Phi        | Lambda  | p      | c   |         |        |    |    |   |    |    |  |
| Robust Design Pradel Lambda Closed Captures with Heterogeneity                                | RDPdLHet          |                             | Phi        | Lambda  | pi     | p   | f0      |        |    |    |   |    |    |  |
| Robust Design Pradel Lambda Full Closed Captures with Het.                                    | RDPdLFullHet      |                             | Phi        | Lambda  | pi     | p   | c       | f0     |    |    |   |    |    |  |
| Robust Design Pradel Lambda Huggins' Closed Captures with Het.                                | RDPdLHugHet       |                             | Phi        | Lambda  | pi     | p   |         |        |    |    |   |    |    |  |
| Robust Design Pradel Lambda Huggins' Full Closed Captures with Het.                           | RDPdLHugFullHet   |                             | Phi        | Lambda  | pi     | p   | c       |        |    |    |   |    |    |  |
| Robust Design Pradel Lambda Closed Population Estimation with mis-identification              | RDPdLIDClosed     |                             | Phi        | Lambda  | p      | c   | alpha   | f0     |    |    |   |    |    |  |
| Robust Design Pradel Lambda Huggins' Closed Populations with mis-identification               | RDPdLIDHuggins    |                             | Phi        | Lambda  | p      | c   | alpha   |        |    |    |   |    |    |  |
| Robust Design Pradel Lambda Closed Captures with Heterogeneity and mis-identification         | RDPdLIDHet        |                             | Phi        | Lambda  | pi     | p   | alpha   | f0     |    |    |   |    |    |  |
| Robust Design Pradel Lambda Full Closed Captures with Het. and mis-identification             | RDPdLIDFullHet    |                             | Phi        | Lambda  | pi     | p   | c       | alpha  | f0 |    |   |    |    |  |

|   |                   |                            |          |         |        |        |         |        |        |     |       |   |
|---|-------------------|----------------------------|----------|---------|--------|--------|---------|--------|--------|-----|-------|---|
| Robust Design Pradel Lambda Huggins' Closed Captures with Het. and mis-identification           | RDPdLIDHugHet     |                            | Phi      | Lambda  | pi     | p      | alpha   |        |        |     |       |   |
| Robust Design Pradel Lambda Huggins' Full Closed Captures with Het. and mis-identification      | RDPdLIDHugFullHet |                            | Phi      | Lambda  | pi     | p      | c       | alpha  |        |     |       |   |
| Robust Design Pradel Recruitment Closed Population Estimation                                   | RDPdfClosed       |                            | Phi      | f       | p      | c      | f0      |        |        |     |       |   |
| Robust Design Pradel Recruitment Huggins' Closed Populations                                    | RDPdfHuggins      |                            | Phi      | f       | p      | c      |         |        |        |     |       |   |
| Robust Design Pradel Recruitment Closed Captures with Heterogeneity                             | RDPdfHet          |                            | Phi      | f       | pi     | p      | f0      |        |        |     |       |   |
| Robust Design Pradel Recruitment Full Closed Captures with Het.                                 | RDPdfFullHet      |                            | Phi      | f       | pi     | p      | c       | f0     |        |     |       |   |
| Robust Design Pradel Recruitment Huggins' Closed Captures with Het.                             | RDPdfHugHet       |                            | Phi      | f       | pi     | p      |         |        |        |     |       |   |
| Robust Design Pradel Recruitment Huggins' Full Closed Captures with Het.                        | RDPdfHugFullHet   |                            | Phi      | f       | pi     | p      | c       |        |        |     |       |   |
| Robust Design Pradel Recruitment Closed Population Estimation with mis-identification           | RDPdfIDClosed     |                            | Phi      | f       | p      | c      | alpha   | f0     |        |     |       |   |
| Robust Design Pradel Recruitment Huggins' Closed Populations with mis-identification            | RDPdfIDHuggins    |                            | Phi      | f       | p      | c      | alpha   |        |        |     |       |   |
| Robust Design Pradel Recruitment Closed Captures with Heterogeneity and mis-identification      | RDPdfIDHet        |                            | Phi      | f       | pi     | p      | alpha   | f0     |        |     |       |   |
| Robust Design Pradel Recruitment Full Closed Captures with Het. and mis-identification          | RDPdfIDFullHet    |                            | Phi      | f       | pi     | p      | c       | alpha  | f0     |     |       |   |
| Robust Design Pradel Recruitment Huggins' Closed Captures with Het. and mis-identification      | RDPdfIDHugHet     |                            | Phi      | f       | pi     | p      | alpha   |        |        |     |       |   |
| Robust Design Pradel Recruitment Huggins' Full Closed Captures with Het. and mis-identification | RDPdfIDHugFullHet |                            | Phi      | f       | pi     | p      | c       | alpha  |        |     |       |   |
| Open Robust Design Pradel Multi-state   | ORDPdMS           |                            | S        | Psi     | Gamma  | pent   | Phi     | p      |        |     |       |   |
| Huggins Closed Robust Design Multi-state with State Probabilities                               | CRDMSOHug         |                            | S        | Psi     | Omega  | p      | c       |        |        |     |       |   |
| Huggins Heterogeneity Closed Robust Design Multi-state with State Probabilities                 | CRDMSOHet         |                            | S        | Psi     | Omega  | pi     | p       |        |        |     |       |   |
| Huggins Full Heterogeneity Closed Robust Design Multi-state with State Probabilities            | CRDMSOFHet        |                            | S        | Psi     | Omega  | pi     | p       | c      |        |     |       |   |
| Occupancy Heterogeneity Estimation with Detection < 1   | OccupHet          | ?salamander                | pi       | p       | Psi    |        |         |        |        |     |       |   |
| RD Occupancy Heterogeneity Estimation with psi, epsilon   | RDOccupHetPE      |                            | Psi      | Epsilon | pi     | p      |         |        |        |     |       |   |
| RD Occupancy Heterogeneity Estimation with psi, gamma   | RDOccupHetPG      |                            | Psi      | Gamma   | pi     | p      |         |        |        |     |       |   |
| RD Occupancy Heterogeneity Estimation with psi(1), gamma, epsilon                               | RDOccupHetEG      |                            | Psi      | Epsilon | Gamma  | pi     | p       |        |        |     |       |   |
| Occupancy Estimation Royle/Nichols Poisson Abundance  | OccupRNPoisson    | ?Donovan.7                 | r        | Lambda  |        |        |         |        |        |     |       |   |
| Occupancy Estimation Royle/Nichols Negative Binomial Abundance                                  | OccupRNNegBin     | ?Donovan.7                 | r        | Lambda  | VarAdd |        |         |        |        |     |       |   |
| Two species Occupancy Estimation  | 2SpecOccup        |                            | PsiAB    | PsiA    | PsiB   | pA     | pB      | rAB    | rAb    | raB |       |   |
| Logit-Normal Mark Resight   | LogitNormalMR     | ?LogitNormalMR             | p        | sigma   | N      |        |         |        |        |     |       |   |
| Poisson Mark Resight with Robust Design   | PoissonMR         | ?PoissonMR, ?Poisson_twoMR | alpha    | sigma   | U      | Phi    | Gamma'' | Gamma' |        |     |       |   |
| Multiple-State Occupancy Estimation   | MSOccupancy       | ?NicholsMSOccupancy        | Psi1     | Psi2    | p1     | p2     | Delta   |        |        |     |       |   |
| Occupancy Estimation Royle Poisson Counts   | OccupRPoisson     | ?Donovan.8                 | r        | Lambda  |        |        |         |        |        |     |       |   |
| Occupancy Estimation Royle Negative Binomial Counts   | OccupRNegBin      | ?Donovan.8                 | r        | Lambda  | VarAdd |        |         |        |        |     |       |   |
| Open Robust Design Multi-state with State Probabilities   | ORDMSState        |                            | S        | Psi     | Omega  | pent   | Phi     | p      |        |     |       |   |
| Immigration-Emigration Logit-Normal Mark Resight  | IELogitNormalMR   | ?IELogitNormalMR           | p        | sigma   | Nbar   | alpha  | Nstar   |        |        |     |       |   |
| Robust Design Multi-state Closed with Mis-classification  | RDMSMisClass      |                            | S        | Psi     | pi     | Omega  | p       | Delta  |        |     |       |   |
| Robust Design Multi-state Closed with 2 Mis-classifications                                     | RDMS2MisClass     |                            | S        | Psi     | pi     | Omega  | p       | Delta  |        |     |       |   |
| Multi-scale occupancy estimation  | MultScalOcc       | ?larksparrow               | Psi      | Theta   | p      |        |         |        |        |     |       |   |
| Robust Design Multiple-State Occupancy Estimation Conditional Binomial                          | RDMSOccRepro      |                            | Phi0     | Psi     | R      | p      | Delta   |        |        |     |       |   |
| Robust Design Multiple-State Occupancy Estimation General                                       | RDMSOccupancy     |                            | Phi0     | Psi     | p      |        |         |        |        |     |       |   |
| Robust Design Multi-state Open with Mis-classification  | RDMSOpenMisClass  |                            | S        | Psi     | pi     | Omega  | p       | Delta  | pent   | Phi |       |   |
| Density estimation with Huggins p and c   | Densitytc         | ?Density                   | p        | c       | ptilde |        |         |        |        |     |       |   |
| Density estimation with Huggins heterogeneity pi and p  | DensityHet        | ?Density                   | pi       | p       | ptilde |        |         |        |        |     |       |   |
| Density estimation with Huggins full heterogeneity pi, p and c                                  | DensityFHet       | ?Density                   | pi       | p       | c      | ptilde |         |        |        |     |       |   |
| Cormack-Jolly-Seber model with Pledger mixtures   | CJSMixture        |                            | pi       | Phi     | p      |        |         |        |        |     |       |   |
| Pradel Survival and Seniority with Pledger mixtures   | PradSenMix        |                            | Phi      | pi      | p      | Gamma  |         |        |        |     |       |   |
| Pradel Survival and Lambda with Pledger mixtures  | PradLambdaMix     |                            | Phi      | pi      | p      | Lambda |         |        |        |     |       |   |
| Pradel Survival and Recruitment with Pledger mixtures   | PradRecMix        |                            | Phi      | pi      | p      | f      |         |        |        |     |       |   |
| Link-Barker Survival and Recruitment with Pledger mixtures                                      | LinkBarkMix       |                            | Phi      | pi      | p      | f      |         |        |        |     |       |   |
| Cormack-Jolly-Seber model with Random Effects   | CJSRandom         |                            | sigmaphi | Phi     | sigmap | p      |         |        |        |     |       |   |
| Link-Barker Survival and Recruitment with Random Effects  | LinkBarkRan       |                            | sigmaphi | Phi     | sigmap | p      | sigmaf  | f      |        |     |       |   |
| Two species Conditional Occupancy Estimation  | 2SpecConOccup     |                            | PsiA     | PsiBA   | PsiBa  | pA     | pB      | rA     | rBA    | rBa |       |   |
| Burnham Live and Dead Encounters with Random Effects  | BurnhamLDRE       |                            | sigmaS   | S       | sigmap | p      | sigmar  | r      | sigmaF | F   |       |   |
| Pledger Mixture Dead Recoveries (Seber)   | PMDead            | ?brownie                   | pi       | S       | r      |        |         |        |        |     |       |   |
| Random Effects Dead Recoveries (Seber)  | REDead            | ?brownie                   | SigmaS   | S       | sigmar | r      |         |        |        |     |       |   |
| Robust Design Two species Gamma Epsilon Conditional Occupancy Estimation                        | RD2SpGEConOcc     |                            |          |         |        |        |         |        |        |     |       |   |
| Robust Design Multi-state Open with State Uncertainty and Seasonal Effects                      | RDMSOpenMCSeas    |                            | S        | Psi     | pi     | Omega  | p       | Delta  | pent   | d   | alpha | c |
| Occupancy with correlated detections  | OccClus           |                            |          |         |        |        |         |        |        |     |       |   |
| Occupancy with relaxed closure  | OccRelClos        |                            | p        | Psi     | pent   | d      |         |        |        |     |       |   |
| Huggins' p and c with Random Effects  | HugginsRE         |                            | p        | c       | sigmap |        |         |        |        |     |       |   |
| Robust Design with Huggins' p and c with Random Effects   | RDHugginsRE       |                            | S        | Gamma'' | Gamma' | sigmap | p       | c      |        |     |       |   |
| Closed Robust Design Multi-state Huggins' p and c with Random Effects                           | HRECRDMS          |                            |          |         |        |        |         |        |        |     |       |   |
| Robust Design Pradel Seniority Huggins' p and c with Random Effects                             | RDPDGHUGRE        |                            |          |         |        |        |         |        |        |     |       |   |
| Robust Design Pradel Lambda Huggins' p and c with Random Effects                                | RDPDLHUGRE        |                            |          |         |        |        |         |        |        |     |       |   |
| Robust Design Pradel f Huggins' p and c with Random Effects                                     | RDPDFHUGRE        |                            |          |         |        |        |         |        |        |     |       |   |
| Occupancy Estimation with Detection < 1 and Random Effects                                      | OccupancyRE       |                            | sigmap   | p       | Psi    |        |         |        |        |     |       |   |
| Robust Design Occupancy Estimation with psi, epsilon and Random Effects                         | RDOccupREPE       |                            |          |         |        |        |         |        |        |     |       |   |

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