Supplementary Information - Multi-state modelling of true reproductive states of individual female right whales provides new insights into their decline

Methods – Model structure

Multi-state mark-recapture models have been in the literature for decades (e.g., [1-3]), with Bayesian implementations of these models being used from almost the start (e.g., [4-6]). This provides us with a robust framework in which the model specifications have been well defined and reviewed for both classical and Bayesian approaches. Within our model, we defined years (t) as the sampling period, where T represents the total number of sampling periods, i is the index for individuals, and M represents the total possible number of individuals in the population. The state and observation vectors used are: O, a vector of length 1 to O, where O represents the number of observed states; S, a vector of 1 to S, where S represents the number of true states; $\boldsymbol{Y_{i,t}}$, the matrix of time dependent observed states for each individual (i.e. capture histories); and $\boldsymbol{Z_{i,t}}$, representing the matrix of time dependent true biological states for each individual, regardless of whether it was observed.

We considered ten different biological states (S) in our model: not yet entered (*NE*), calf alive within study site (*CAI*), pre-breeder alive within study site (*PAI*), breeder alive within study site (*BAI*), pre-breeder alive outside study site (*PAO*), breeder alive outside study site (*BAO*), calf recently dead (*CRD*), pre-breeder recently dead (*PRD*), breeder recently dead (*BRD*), and dead (†). The state transitional matrix $\boldsymbol{\Omega}$ (equation 1) can be represented by a transition matrix $(S \times S)$ with state at time t represented by the rows, and the state at $t+1$ represented by the columns:

$$\Omega = \begin{array}{c} \\ NE \\ CAI \\ PAI \\ BAI \\ PAO \\ BAO \\ CRD \\ PRD \\ BRD \\ \dagger \end{array} \begin{array}{c} \begin{array}{cccccccccc} NE & CAI & PAI & BAI & PAO & BAO & CRD & PRD & BRD & \dagger \end{array} \\ \begin{bmatrix} 1-\gamma & \gamma\varphi^c & \gamma\varphi^N & \gamma\varphi^B & 0 & 0 & \gamma\varphi^{CRD} & 0 & 0 & 0 \\ 0 & 0 & s^c F^c & 0 & s^c(1-F^c) & 0 & 0 & (1-s^c)r^c & 0 & (1-s^c)(1-r^c) \\ 0 & 0 & s^N F^N(1-\psi) & s^N F^N \psi & s^N(1-F^N)(1-\psi) & s^N(1-F^N)\psi & 0 & (1-s^N)r^N(1-\psi) & (1-s^N)r^N\psi & (1-s^N)(1-r^N) \\ 0 & 0 & 0 & s^B F^B & 0 & s^B(1-F^B) & 0 & 0 & (1-s^B)r^B & (1-s^B)(1-r^B) \\ 0 & 0 & 0 & 0 & s^N(1-\psi) & s^N\psi & 0 & (1-s^N)r^N(1-\psi) & (1-s^N)r^N\psi & (1-s^N)(1-r^N) \\ 0 & 0 & 0 & 0 & 0 & s^B & 0 & 0 & (1-s^B)r^B & (1-s^B)(1-r^B) \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \end{array} \quad (1)$$

These true states underlie the eight possible observable states (O); 1: seen as a calf, 2: seen as a pre-breeder, 3: seen as a breeder, 4: seen in unknown state, 5: recovered as a calf, 6: recovered as a pre-breeder, 7: recovered as a breeder, or 8: neither seen nor recovered. The observation matrix $\boldsymbol{\Theta}$ (equation 2), which is dependent on the true underlying states, is described by the state specific detection probabilities p. To account for the uncertainty in observation assignment for both pre-breeders and breeders we included an unknown state assignment δ, where individuals whose state could not be ascertained for part or all of the study period were assigned a state at first capture. This observational process can be described by a row stochastic matrix $(S \times O)$ with states represented in rows and observations in columns:

$$\Theta \quad \begin{array}{c} \\ NE \\ CAI \\ PAI \\ BAI \\ PAO \\ BAO \\ CRD \\ PRD \\ BRD \\ \dagger \end{array} \begin{array}{c} \begin{array}{cccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \end{array} \\ \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & p^N\delta^N & 0 & p^N(1-\delta^N) & 0 & 0 & 0 & 1-p^N \\ 0 & 0 & p^B\delta^B & p^B(1-\delta^B) & 0 & 0 & 0 & 1-p^B \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \end{array} \qquad (2)$$

In order to derive estimates of abundance, data augmentation was used to account for individuals who may enter the population, yet never be seen[7]. In this process, the true capture histories, *n*, of observed individuals are augmented with all neither seen nor recovered (state 8) capture histories, up to *M* possible individuals, in order to derive $N_{t,}$ the number of individuals in the population at time *t*. We denote γ_t as the probability that an individual in *M* enters the population, who has not previously done so, which is referred to as the removal entry probability. Multi-state mark-recapture models are traditionally conditioned on the first capture, which means there is no way to calculate γ_1. In order to overcome this, we add an additional time occasion to the capture histories in which all individuals are considered to be in the unknown state[8]. In this study, we allowed up to 300 additional individual whales to enter the population over the study period, combined with the 318 observed individuals, resulting in $M = 618$. The expected number of individuals entering the population at time *t* (B_t) can then be calculated as:

$$B_t = \sum_{i=1}^{M} (1 - Z_{i,t-1}) Z_{i,t}$$

while the population size at *t* is:

$$N_t = \sum_{i=1}^{M} Z_{i,t}$$

Issues with parameter identifiability are well documented within the mark-recapture literature[8, 9]. Parameter estimates for state specific recapture probabilities were weakly identifiable for a number of years due to the lack of data available to inform these priors in many of the sample periods. These parameters were kept as time varying within the model as the information they provided for years with data was more informative and biologically reasonable than collating the information into a single mean parameter for the entire sample period. The posterior distribution for recovery parameters can be seen in Fig. S1.

References

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7. Royle, J.A. and R.M. Dorazio, *Parameter-expanded data augmentation for Bayesian analysis of capture–recapture models.* Journal of Ornithology, 2012. **152**(2): p. 521-537.
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Model code

```
model {
# ------------------------------------------------
# Parameters:
# sCalf: Calf true survival probability
# sPB: Pre-breeder true survival probability
# sB: Breeder true survival probability
# FCalf: Calf fidelity probability
# FPB: Pre-breeder fidelity probability
# FB: Breeder fidelity probability
# rCalf: Calf recovery probability
# rPB: Pre-breeder recovery probability
# rB: Breeder recovery probability
# pPB: Pre-breeder recapture/resighting probability
# pB: Breeder recapture/resighting probability
# psi: transition probability from Pre-breeder to Breeder
# phi: state assignment probability
# gamma: removal entry probability
# ------------------------------------------------
# States (S):
# 1 not yet entered
# 2 Calf alive in study area
# 3 Pre-breeder alive in study area
# 4 Breeder alive in study area
# 5 Pre-breeder alive outside study area
# 6 Breeder alive outside study area
# 7 Calf recently dead and recovered
# 8 Pre-breeder recently dead and recovered
# 9 Breeder recently dead and recovered
# 10 recently dead, but not recovered, or dead (absorbing)
```

```
# Observations (O):
# 1 Calf seen alive
# 2 Pre-breeder seen alive
# 3 Breeder seen alive
# 4 Unknown state seen alive
# 5 Calf recovered dead
# 6 Pre-breeder recovered dead
# 7 Breeder recovered dead
# 8 Neither seen nor recovered
# ------------------------------------------------

# Priors and constraints

for (i in 1:M){
for (t in 1:(n.occasions-1)){
   sCalf[i,t] = mean_sCalf[t]
   FCalf[i,t] = mean_fCalf[t]
   rCalf[i,t] = mean_rCalf[t]
   sPB[i,t]  = mean_sPB[t]
   FPB[i,t]  = mean_fPB[t]
   rPB[i,t]  = mean_rPB[t]
   pPB[i,t]  = mean_pPB[t]
   sB[i,t]   = mean_sB[t]
   FB[i,t]   = mean_fB[t]
   rB[i,t]   = mean_rB[t]
   pB[i,t]   = mean_pB[t]
  psi[i,t]   = mean_psi[group[i]]
}
}

for (t in 1:(n.occasions-1)){
```

```
mean_sCalf[t] ~ dunif(0, 1)     # Prior for mean calf survival
mean_fCalf[t] ~ dunif(0, 1)     # Prior for mean calf survival
mean_rCalf[t] ~ dunif(0, 1)     # Prior for mean calf recovery
mean_sPB[t] ~ dunif(0, 1)     # Prior for mean pre-breeder survival
mean_fPB[t] ~ dunif(0, 1)     # Prior for mean pre-breeder survival
mean_rPB[t] ~ dunif(0, 1)     # Prior for mean pre-breeder recovery
mean_pPB[t] ~ dunif(0, 1)     # Prior for mean pre-breeder recapture
mean_sB[t] ~ dunif(0, 1)     # Prior for mean breeder survival
mean_fB[t] ~ dunif(0, 1)     # Prior for mean breeder survival
mean_rB[t] ~ dunif(0, 1)     # Prior for mean breeder recovery
mean_pB[t] ~ dunif(0, 1)     # Prior for mean breeder recapture
gamma[t] ~ dunif(0, 1) # Prior for entry probabilities
}

for (u in 1:g){
mean_psi[u] ~ dunif(0, 1) # Prior for transition probability
}
# State assignments: gamma priors
  for (u in 1:4){
     alpha_phi[u] ~ dgamma(1, 1)
     phi[u] <- alpha_phi[u]/sum(alpha_phi [])
  }
# Unknown state assignment
 for (x in 1:2){
   alpha_delta[x] ~ dgamma(1, 1)
   delt[x] <- alpha_delta[x] / sum(alpha_delta[])
 }

# Define state-transition and observation matrices
for (i in 1:M){
  # Define probabilities of state S(t+1) given S(t)
```

```
for (t in 1:(n.occasions-1)){
  ps[1, i, t, 1] = 1.0 - gamma[t]
  ps[1, i, t, 2] = gamma[t] * phi[1]
  ps[1, i, t, 3] = gamma[t] * phi[2]
  ps[1, i, t, 4] = gamma[t] * phi[3]
  ps[1, i, t, 5] = 0.0
  ps[1, i, t, 6] = 0.0
  ps[1, i, t, 7] = gamma[t] * phi[4]
  ps[1, i, t, 8] = 0.0
  ps[1, i, t, 9] = 0.0
  ps[1, i, t, 10] = 0.0
  ps[2, i, t, 1] = 0.0
  ps[2, i, t, 2] = 0.0
  ps[2, i, t, 3] = sCalf[i,t] * FCalf[i,t]
  ps[2, i, t, 4] = 0.0
  ps[2, i, t, 5] = sCalf[i,t] * (1.0 - FCalf[i,t])
  ps[2, i, t, 6] = 0.0
  ps[2, i, t, 7] = 0.0
  ps[2, i, t, 8] = (1.0 - sCalf[i,t]) * rCalf[i,t]
  ps[2, i, t, 9] = 0.0
  ps[2, i, t, 10] = (1.0 - sCalf[i,t]) * (1.0 - rCalf[i,t])
  ps[3, i, t, 1] = 0.0
  ps[3, i, t, 2] = 0.0
  ps[3, i, t, 3] = sPB[i,t] * FPB[i,t] * (1.0 – psi[i.t])
  ps[3, i, t, 4] = sPB[i,t] * FPB [i,t] * psi[i.t]
  ps[3, i, t, 5] = sPB[i,t] * (1.0 - FPB [i,t]) * (1.0 - psi[i.t])
  ps[3, i, t, 6] = sPB[i,t] * (1.0 - FPB [i,t]) * psi[i.t]
  ps[3, i, t, 7] = 0.0
  ps[3, i, t, 8] = (1.0 - sPB[i,t]) * rPB[i,t] * (1.0 - psi[i.t])
  ps[3, i, t, 9] = (1.0 - sPB[i,t]) * rPB[i,t] * psi[i.t]
  ps[3, i, t, 10] = (1.0 - sPB[i,t]) * (1.0 - rPB[i,t])
```

ps[4, i, t, 1] = 0.0

ps[4, i, t, 2] = 0.0

ps[4, i, t, 3] = 0.0

ps[4, i, t, 4] = sB[i,t] * FB[i,t]

ps[4, i, t, 5] = 0.0

ps[4, i, t, 6] = sB[i,t] * (1.0 - FB[i,t])

ps[4, i, t, 7] = 0.0

ps[4, i, t, 8] = 0.0

ps[4, i, t, 9] = (1.0 - sB[i,t]) * rB[i,t]

ps[4, i, t, 10] = (1.0 - sB[i,t]) * (1.0 - rB[i,t])

ps[5, i, t, 1] = 0.0

ps[5, i, t, 2] = 0.0

ps[5, i, t, 3] = 0.0

ps[5, i, t, 4] = 0.0

ps[5, i, t, 5] = sPB[i,t] * (1.0 - psi[i.t])

ps[5, i, t, 6] = sPB[i,t] * psi[i.t]

ps[5, i, t, 7] = 0.0

ps[5, i, t, 8] = (1.0 - sPB[i,t]) * rPB[i,t] * (1.0 - psi[i.t])

ps[5, i, t, 9] = (1.0 - sPB[i,t]) * rPB[i,t] * psi[i.t]

ps[5, i, t, 10] = (1.0 - sPB[i,t]) * (1.0 - rPB[i,t])

ps[6, i, t, 1] = 0.0

ps[6, i, t, 2] = 0.0

ps[6, i, t, 3] = 0.0

ps[6, i, t, 4] = 0.0

ps[6, i, t, 5] = 0.0

ps[6, i, t, 6] = sB[i,t]

ps[6, i, t, 7] = 0.0

ps[6, i, t, 8] = 0.0

ps[6, i, t, 9] = (1.0 - sB[i,t]) * rB[i,t]

ps[6, i, t, 10] = (1.0 - sB[i,t]) * (1.0 - rB[i,t])

ps[7, i, t, 1] = 0.0

ps[7, i, t, 2] = 0.0

ps[7, i, t, 3] = 0.0

ps[7, i, t, 4] = 0.0

ps[7, i, t, 5] = 0.0

ps[7, i, t, 6] = 0.0

ps[7, i, t, 7] = 0.0

ps[7, i, t, 8] = 0.0

ps[7, i, t, 9] = 0.0

ps[7, i, t, 10] = 1.0

ps[8, i, t, 1] = 0.0

ps[8, i, t, 2] = 0.0

ps[8, i, t, 3] = 0.0

ps[8, i, t, 4] = 0.0

ps[8, i, t, 5] = 0.0

ps[8, i, t, 6] = 0.0

ps[8, i, t, 7] = 0.0

ps[8, i, t, 8] = 0.0

ps[8, i, t, 9] = 0.0

ps[8, i, t, 10] = 1.0

ps[9, i, t, 1] = 0.0

ps[9, i, t, 2] = 0.0

ps[9, i, t, 3] = 0.0

ps[9, i, t, 4] = 0.0

ps[9, i, t, 5] = 0.0

ps[9, i, t, 6] = 0.0

ps[9, i, t, 7] = 0.0

ps[9, i, t, 8] = 0.0

ps[9, i, t, 9] = 0.0

ps[9, i, t, 10] = 1.0

ps[10, i, t, 1] = 0.0

ps[10, i, t, 2] = 0.0

ps[10, i, t, 3] = 0.0

ps[10, i, t, 4] = 0.0

ps[10, i, t, 5] = 0.0

ps[10, i, t, 6] = 0.0

ps[10, i, t, 7] = 0.0

ps[10, i, t, 8] = 0.0

ps[10, i, t, 9] = 0.0

ps[10, i, t, 10] = 1.0

Define probabilities of O(t) given S(t)

po[1, i, t, 1] = 0.0

po[1, i, t, 2] = 0.0

po[1, i, t, 3] = 0.0

po[1, i, t, 4] = 0.0

po[1, i, t, 5] = 0.0

po[1, i, t, 6] = 0.0

po[1, i, t, 7] = 0.0

po[1, i, t, 8] = 1.0

po[2, i, t, 1] = 1.0

po[2, i, t, 2] = 0.0

po[2, i, t, 3] = 0.0

po[2, i, t, 4] = 0.0

po[2, i, t, 5] = 0.0

po[2, i, t, 6] = 0.0

po[2, i, t, 7] = 0.0

po[2, i, t, 8] = 0.0

po[3, i, t, 1] = 0.0

po[3, i, t, 2] = pPB[i,t] * delt[1]

po[3, i, t, 3] = 0.0

po[3, i, t, 4] = pPB[i,t] * delt[2]

po[3, i, t, 5] = 0.0

po[3, i, t, 6] = 0.0

po[3, i, t, 7] = 0.0

po[3, i, t, 8] = 1.0 - pPB[i,t]

po[4, i, t, 1] = 0.0

po[4, i, t, 2] = 0.0

po[4, i, t, 3] = pB[i,t] * delt[2]

po[4, i, t, 4] = pB[i,t] * delt[1]

po[4, i, t, 5] = 0.0

po[4, i, t, 6] = 0.0

po[4, i, t, 7] = 0.0

po[4, i, t, 8] = 1.0 - pB[i,t]

po[5, i, t, 1] = 0.0

po[5, i, t, 2] = 0.0

po[5, i, t, 3] = 0.0

po[5, i, t, 4] = 0.0

po[5, i, t, 5] = 0.0

po[5, i, t, 6] = 0.0

po[5, i, t, 7] = 0.0

po[5, i, t, 8] = 1.0

po[6, i, t, 1] = 0.0

po[6, i, t, 2] = 0.0

po[6, i, t, 3] = 0.0

po[6, i, t, 4] = 0.0

po[6, i, t, 5] = 0.0

po[6, i, t, 6] = 0.0

po[6, i, t, 7] = 0.0

po[6, i, t, 8] = 1.0

po[7, i, t, 1] = 0.0

po[7, i, t, 2] = 0.0

po[7, i, t, 3] = 0.0

po[7, i, t, 4] = 0.0

```
  po[7, i, t, 5] = 1.0
  po[7, i, t, 6] = 0.0
  po[7, i, t, 7] = 0.0
  po[7, i, t, 8] = 0.0
  po[8, i, t, 1] = 0.0
  po[8, i, t, 2] = 0.0
  po[8, i, t, 3] = 0.0
  po[8, i, t, 4] = 0.0
  po[8, i, t, 5] = 0.0
  po[8, i, t, 6] = 1.0
  po[8, i, t, 7] = 0.0
  po[8, i, t, 8] = 0.0
  po[9, i, t, 1] = 0.0
  po[9, i, t, 2] = 0.0
  po[9, i, t, 3] = 0.0
  po[9, i, t, 4] = 0.0
  po[9, i, t, 5] = 0.0
  po[9, i, t, 6] = 0.0
  po[9, i, t, 7] = 1.0
  po[9, i, t, 8] = 0.0
  po[10, i, t, 1] = 0.0
  po[10, i, t, 2] = 0.0
  po[10, i, t, 3] = 0.0
  po[10, i, t, 4] = 0.0
  po[10, i, t, 5] = 0.0
  po[10, i, t, 6] = 0.0
  po[10, i, t, 7] = 0.0
  po[10, i, t, 8] = 1.0
  } #t
} #i
```

```
# Likelihood
for (i in 1:M){
  # Define latent state at first occasion
   z[i,1] <- 1   # Make sure that all M individuals are in state 1 at t=1
   for (t in 2:n.occasions){
      # State process: draw S(t) given S(t-1)
      z[i,t] ~ dcat(ps[z[i,t-1], i, t-1,])
      # Observation process: draw O(t) given S(t)
      y[i,t] ~ dcat(po[z[i,t], i, t-1,])
      } #t
   } #i
# Calculate derived population parameters
for (t in 1:(n.occasions-1)){
   qgamma[t] <- 1-gamma[t]
   }
cprob[1] <- gamma[1]
for (t in 2:(n.occasions-1)){
   cprob[t] <- gamma[t] * prod(qgamma[1:(t-1)])
   } #t
psii <- sum(cprob[])           # Inclusion probability
for (t in 1:(n.occasions-1)){
   b[t] <- cprob[t] / psii      # Entry probability
   } #t


for (i in 1:M){
   for (t in 2:n.occasions){
      alc[i,t-1] <- equals(z[i,t], 2)
      alpb[i,t-1] <- equals(z[i,t], 3)
      alb[i,t-1] <- equals(z[i,t], 4)


      } #t
```

```
  for (t in 1:(n.occasions-1)){
    dc[i,t] <- equals(z[i,t]-alc[i,t],0)
    dpb[i,t] <- equals(z[i,t]-alpb[i,t],0)
    db[i,t] <- equals(z[i,t]-alb[i,t],0)

    } #t
  alivec[i] <- sum(alc[i,]) #alive as a calf
  alivepb[i] <- sum(alpb[i,]) #alive as a pre-breeder
  aliveb[i] <- sum(alb[i,]) #alive as a breeder

  } #i

for (t in 1:(n.occasions-1)){
  Nc[t] <- sum(alc[,t])       # Number of calves at time t
  Npb[t] <- sum(alpb[,t])       # Number of pre-breeders at time t
  Nb[t] <- sum(alb[,t])       # Number of breeders at time t
  N[t] <- sum(alc[,t]) + sum(alpb[,t]) + sum(alb[,t])       # Actual population size
  Bc[t] <- sum(dc[,t])        # Number of calf entries
  Bpbj[t] <- sum(dpb[,t])        # Number of pre-breeder entries
  Bb[t] <- sum(db[,t])        # Number of breeder entries
  B[t] <- sum(dc[,t])  + sum(dpb[,t]) + sum(db[,t])        # Number of entries

  } #t
for (i in 1:M){
  alive[i] <- alivec[i] + alivepb[i] + aliveb[i]
  w[i] <- 1-equals(alive[i],0)
  } #i
Nsuper <- sum(w[])          # Superpopulation size
```

Model output

SI Table 1: Parameter and state estimations from the multi-state mark-recapture-recovery model for female right whales.

Parameter	mean	sd	2.50%	97.50%	Rhat	n.eff
Abundance [1977]	8.38	3.29	5.00	17.00	1	9969
Abundance [1978]	14.73	3.87	9.00	24.00	1	15392
Abundance [1979]	27.92	4.95	20.00	39.00	1	19054
Abundance [1980]	48.05	4.13	40.00	56.00	1	25224
Abundance [1981]	57.89	2.38	54.00	63.00	1	31506
Abundance [1982]	66.77	2.00	63.00	71.00	1	29138
Abundance [1983]	72.86	1.82	70.00	77.00	1	20123
Abundance [1984]	77.18	2.14	73.00	82.00	1	23827
Abundance [1985]	81.23	2.08	78.00	86.00	1	22580
Abundance [1986]	86.24	2.12	83.00	91.00	1	21830
Abundance [1987]	95.20	2.21	91.00	100.00	1	27954
Abundance [1988]	99.19	1.50	97.00	103.00	1	21600
Abundance [1989]	110.03	1.84	107.00	114.00	1	19303
Abundance [1990]	113.93	1.86	111.00	118.00	1	17918
Abundance [1991]	117.50	2.40	113.00	123.00	1	14242
Abundance [1992]	121.17	2.35	117.00	126.00	1	11161
Abundance [1993]	118.35	2.48	114.00	124.00	1	17520
Abundance [1994]	119.68	1.40	118.00	123.00	1	19891
Abundance [1995]	120.53	1.18	119.00	123.00	1	27642
Abundance [1996]	127.65	1.59	125.00	131.00	1	18355
Abundance [1997]	128.42	1.42	126.00	132.00	1	24408
Abundance [1998]	125.61	1.24	124.00	128.00	1	26641
Abundance [1999]	123.13	1.32	121.00	126.00	1	30993
Abundance [2000]	121.27	1.09	120.00	124.00	1	34596
Abundance [2001]	134.99	1.70	132.00	139.00	1	20450
Abundance [2002]	137.50	1.67	135.00	141.00	1	30435
Abundance [2003]	139.67	1.25	138.00	143.00	1	29873
Abundance [2004]	139.21	1.30	137.00	142.00	1	32172
Abundance [2005]	148.83	0.90	148.00	151.00	1	33601
Abundance [2006]	149.71	1.34	148.00	153.00	1	21495
Abundance [2007]	152.43	0.68	152.00	154.00	1	59688
Abundance [2008]	160.53	0.70	160.00	162.00	1	69878
Abundance [2009]	177.85	0.88	177.00	180.00	1	38798
Abundance [2010]	184.81	1.29	183.00	188.00	1	21404
Abundance [2011]	184.28	1.19	183.00	187.00	1	28156
Abundance [2012]	178.98	1.52	177.00	182.00	1	23633
Abundance [2013]	184.07	1.92	181.00	188.00	1	18124
Abundance [2014]	176.17	2.23	172.00	181.00	1	23581
Abundance [2015]	172.18	2.64	168.00	178.00	1	20516
Abundance [2016]	168.26	2.60	164.00	174.00	1	30709
Abundance [2017]	154.30	1.72	152.00	158.00	1	40279

Abundance [2018]	141.72	3.90	135.00	150.00	1	20305
Pre-breeder Abundance [1977]	7.22	3.21	4.00	15.00	1	10685
Pre-breeder Abundance [1978]	13.45	3.74	8.00	22.00	1	15513
Pre-breeder Abundance [1979]	24.39	4.77	17.00	35.00	1	19405
Pre-breeder Abundance [1980]	41.49	4.07	34.00	49.00	1	23383
Pre-breeder Abundance [1981]	49.30	2.43	45.00	54.00	1	20238
Pre-breeder Abundance [1982]	54.76	2.17	51.00	59.00	1	14321
Pre-breeder Abundance [1983]	58.17	1.98	55.00	62.00	1	10120
Pre-breeder Abundance [1984]	58.62	2.24	55.00	63.00	1	12168
Pre-breeder Abundance [1985]	61.58	2.16	58.00	66.00	1	10575
Pre-breeder Abundance [1986]	63.27	2.33	59.00	68.00	1	8233
Pre-breeder Abundance [1987]	67.34	2.48	63.00	72.00	1	7837
Pre-breeder Abundance [1988]	69.86	1.91	66.00	74.00	1	4051
Pre-breeder Abundance [1989]	71.56	2.23	67.00	76.00	1	4863
Pre-breeder Abundance [1990]	74.29	2.27	70.00	79.00	1	5102
Pre-breeder Abundance [1991]	77.16	2.53	72.00	82.00	1	5562
Pre-breeder Abundance [1992]	78.32	2.56	73.00	83.00	1	4170
Pre-breeder Abundance [1993]	76.33	2.72	71.00	82.00	1	5958
Pre-breeder Abundance [1994]	77.47	1.91	74.00	81.00	1	2429
Pre-breeder Abundance [1995]	81.53	1.71	78.00	85.00	1	1929
Pre-breeder Abundance [1996]	85.73	1.98	82.00	90.00	1	2710
Pre-breeder Abundance [1997]	83.17	1.94	79.00	87.00	1	2323
Pre-breeder Abundance [1998]	82.51	1.80	79.00	86.00	1	2193
Pre-breeder Abundance [1999]	79.31	1.81	76.00	83.00	1	2749
Pre-breeder Abundance [2000]	86.52	1.63	83.00	90.00	1	2876
Pre-breeder Abundance [2001]	88.53	2.06	85.00	93.00	1	3950
Pre-breeder Abundance [2002]	93.87	2.14	90.00	98.00	1	4014
Pre-breeder Abundance [2003]	92.76	1.95	89.00	96.00	1	3333
Pre-breeder Abundance [2004]	92.10	1.81	88.00	96.00	1	3397
Pre-breeder Abundance [2005]	92.96	1.39	90.00	96.00	1	2734
Pre-breeder Abundance [2006]	97.84	1.69	95.00	101.00	1	3628
Pre-breeder Abundance [2007]	101.06	1.41	98.00	104.00	1	1314
Pre-breeder Abundance [2008]	106.20	1.34	103.00	109.00	1	1285
Pre-breeder Abundance [2009]	110.58	1.40	108.00	113.00	1	1325
Pre-breeder Abundance [2010]	111.99	1.91	108.00	116.00	1	1573
Pre-breeder Abundance [2011]	106.54	1.79	103.00	110.00	1	1517
Pre-breeder Abundance [2012]	106.41	1.87	103.00	110.00	1	3049
Pre-breeder Abundance [2013]	105.71	2.17	102.00	110.00	1	4854
Pre-breeder Abundance [2014]	102.83	2.43	99.00	108.00	1	7071
Pre-breeder Abundance [2015]	97.67	2.78	93.00	104.00	1	7806
Pre-breeder Abundance [2016]	92.19	2.58	88.00	98.00	1	8260
Pre-breeder Abundance [2017]	82.03	1.99	79.00	86.00	1	5659
Pre-breeder Abundance [2018]	73.39	3.88	67.00	81.00	1	14100
Breeder Abundance [1977]	0.16	0.43	0.00	1.00	1	8454
Breeder Abundance [1978]	1.28	0.56	1.00	3.00	1	29026
Breeder Abundance [1979]	2.53	0.77	2.00	4.00	1	10731

Breeder Abundance [1980]	4.56	0.85	4.00	7.00	1	4867
Breeder Abundance [1981]	6.59	0.85	6.00	9.00	1	2867
Breeder Abundance [1982]	8.01	0.98	7.00	10.00	1	3472
Breeder Abundance [1983]	11.69	0.88	11.00	14.00	1	2747
Breeder Abundance [1984]	14.57	0.82	14.00	17.00	1.01	2071
Breeder Abundance [1985]	17.64	0.88	17.00	20.00	1.01	2155
Breeder Abundance [1986]	18.97	1.07	18.00	22.00	1.01	1816
Breeder Abundance [1987]	20.86	1.38	19.00	24.00	1	2775
Breeder Abundance [1988]	27.33	1.24	26.00	30.00	1.01	1413
Breeder Abundance [1989]	28.46	1.25	27.00	31.00	1	1760
Breeder Abundance [1990]	36.64	1.30	35.00	40.00	1	1642
Breeder Abundance [1991]	35.34	1.53	33.00	39.00	1	4119
Breeder Abundance [1992]	39.85	1.36	38.00	43.00	1	1660
Breeder Abundance [1993]	41.01	1.31	39.00	44.00	1	945
Breeder Abundance [1994]	40.21	1.37	38.00	43.00	1	723
Breeder Abundance [1995]	37.00	1.26	35.00	40.00	1	648
Breeder Abundance [1996]	33.92	1.22	32.00	36.00	1	647
Breeder Abundance [1997]	39.25	1.43	37.00	42.00	1	788
Breeder Abundance [1998]	43.10	1.38	41.00	46.00	1	848
Breeder Abundance [1999]	42.82	1.28	41.00	46.00	1	849
Breeder Abundance [2000]	34.74	1.23	33.00	37.00	1	1139
Breeder Abundance [2001]	33.46	1.17	32.00	36.00	1	1220
Breeder Abundance [2002]	37.63	1.37	36.00	41.00	1	1355
Breeder Abundance [2003]	41.90	1.48	40.00	45.00	1	1794
Breeder Abundance [2004]	42.11	1.45	40.00	45.00	1	1852
Breeder Abundance [2005]	42.87	1.08	41.00	45.00	1	1696
Breeder Abundance [2006]	46.87	1.12	45.00	49.00	1	1945
Breeder Abundance [2007]	43.37	1.32	41.00	46.00	1	1110
Breeder Abundance [2008]	44.33	1.19	43.00	47.00	1	947
Breeder Abundance [2009]	49.27	1.16	48.00	52.00	1	970
Breeder Abundance [2010]	64.82	1.42	63.00	68.00	1	639
Breeder Abundance [2011]	70.74	1.36	69.00	74.00	1	648
Breeder Abundance [2012]	70.57	1.26	69.00	73.00	1	776
Breeder Abundance [2013]	69.36	1.45	67.00	72.00	1	1353
Breeder Abundance [2014]	73.34	1.18	71.00	76.00	1	867
Breeder Abundance [2015]	68.50	1.57	66.00	72.00	1	1961
Breeder Abundance [2016]	68.07	1.62	65.00	71.00	1	2424
Breeder Abundance [2017]	71.27	1.22	69.00	74.00	1.01	1280
Breeder Abundance [2018]	68.33	1.73	65.00	72.00	1	3953
Unknown state assignment [Pre-breeder]	0.47	0.01	0.44	0.49	1	1182
Unknown state assignment [Breeder]	0.53	0.01	0.51	0.56	1	1182
Removal entry [1977]	0.02	0.01	0.00	0.03	1	16130
Removal entry [1978]	0.01	0.01	0.00	0.03	1	21432
Removal entry [1979]	0.02	0.01	0.01	0.05	1	25699
Removal entry [1980]	0.04	0.01	0.01	0.06	1	29837
Removal entry [1981]	0.02	0.01	0.01	0.04	1	39112

Removal entry [1982]	0.02	0.01	0.01	0.03	1	67815
Removal entry [1983]	0.01	0.01	0.00	0.03	1	67813
Removal entry [1984]	0.01	0.01	0.00	0.03	1	89563
Removal entry [1985]	0.01	0.01	0.00	0.02	1	63871
Removal entry [1986]	0.02	0.01	0.01	0.04	1	70199
Removal entry [1987]	0.02	0.01	0.01	0.04	1	97964
Removal entry [1988]	0.01	0.01	0.00	0.03	1	69383
Removal entry [1989]	0.03	0.01	0.01	0.05	1	107462
Removal entry [1990]	0.01	0.01	0.00	0.03	1	87163
Removal entry [1991]	0.02	0.01	0.01	0.04	1	79435
Removal entry [1992]	0.01	0.01	0.00	0.03	1	62006
Removal entry [1993]	0.01	0.01	0.00	0.02	1	57856
Removal entry [1994]	0.01	0.01	0.00	0.02	1	57603
Removal entry [1995]	0.01	0.00	0.00	0.02	1	108055
Removal entry [1996]	0.02	0.01	0.01	0.04	1	110846
Removal entry [1997]	0.02	0.01	0.01	0.04	1	114791
Removal entry [1998]	0.00	0.00	0.00	0.01	1	50637
Removal entry [1999]	0.01	0.00	0.00	0.02	1	77879
Removal entry [2000]	0.00	0.00	0.00	0.01	1	51261
Removal entry [2001]	0.04	0.01	0.02	0.06	1	115249
Removal entry [2002]	0.03	0.01	0.01	0.05	1	118661
Removal entry [2003]	0.02	0.01	0.01	0.04	1	130343
Removal entry [2004]	0.02	0.01	0.01	0.03	1	136476
Removal entry [2005]	0.04	0.01	0.02	0.06	1	149851
Removal entry [2006]	0.03	0.01	0.01	0.04	1	135439
Removal entry [2007]	0.03	0.01	0.01	0.05	1	149321
Removal entry [2008]	0.03	0.01	0.02	0.05	1	159282
Removal entry [2009]	0.06	0.01	0.04	0.09	1	157547
Removal entry [2010]	0.03	0.01	0.02	0.06	1	144160
Removal entry [2011]	0.03	0.01	0.01	0.05	1	149683
Removal entry [2012]	0.01	0.01	0.00	0.02	1	114738
Removal entry [2013]	0.03	0.01	0.02	0.05	1	110472
Removal entry [2014]	0.00	0.00	0.00	0.01	1	52140
Removal entry [2015]	0.03	0.01	0.01	0.05	1	117135
Removal entry [2016]	0.03	0.01	0.01	0.05	1	137380
Removal entry [2017]	0.01	0.00	0.00	0.02	1	91671
Removal entry [2018]	0.00	0.00	0.00	0.01	1	51805
Breeder fidelity [1977]	0.50	0.29	0.03	0.98	1	305548
Breeder fidelity [1978]	0.86	0.12	0.54	1.00	1	48490
Breeder fidelity [1979]	0.92	0.08	0.72	1.00	1	36515
Breeder fidelity [1980]	0.95	0.04	0.84	1.00	1	37975
Breeder fidelity [1981]	0.97	0.03	0.90	1.00	1	36390
Breeder fidelity [1982]	0.98	0.02	0.92	1.00	1	50807
Breeder fidelity [1983]	0.98	0.02	0.93	1.00	1	51004
Breeder fidelity [1984]	0.96	0.03	0.89	1.00	1	10422
Breeder fidelity [1985]	0.98	0.02	0.92	1.00	1	44865

Breeder fidelity [1986]	0.95	0.04	0.86	1.00	1.01	6268
Breeder fidelity [1987]	0.97	0.03	0.90	1.00	1	19422
Breeder fidelity [1988]	0.98	0.02	0.92	1.00	1	37129
Breeder fidelity [1989]	0.97	0.02	0.92	1.00	1.01	18603
Breeder fidelity [1990]	0.98	0.02	0.92	1.00	1	29980
Breeder fidelity [1991]	0.98	0.02	0.92	1.00	1	27691
Breeder fidelity [1992]	0.98	0.02	0.93	1.00	1	34737
Breeder fidelity [1993]	0.95	0.04	0.86	1.00	1	6601
Breeder fidelity [1994]	0.97	0.03	0.91	1.00	1	28044
Breeder fidelity [1995]	0.98	0.02	0.92	1.00	1	25895
Breeder fidelity [1996]	0.97	0.02	0.91	1.00	1	9799
Breeder fidelity [1997]	0.96	0.03	0.90	1.00	1.01	5572
Breeder fidelity [1998]	0.98	0.02	0.93	1.00	1	23966
Breeder fidelity [1999]	0.97	0.02	0.92	1.00	1.01	15571
Breeder fidelity [2000]	0.97	0.02	0.91	1.00	1	13345
Breeder fidelity [2001]	0.98	0.02	0.92	1.00	1	16003
Breeder fidelity [2002]	0.95	0.03	0.88	1.00	1.02	3907
Breeder fidelity [2003]	0.95	0.03	0.88	1.00	1.04	5441
Breeder fidelity [2004]	0.96	0.03	0.90	1.00	1.01	5111
Breeder fidelity [2005]	0.99	0.01	0.95	1.00	1	45868
Breeder fidelity [2006]	0.97	0.02	0.91	1.00	1	5367
Breeder fidelity [2007]	0.97	0.02	0.92	1.00	1.01	5075
Breeder fidelity [2008]	0.98	0.01	0.95	1.00	1	17766
Breeder fidelity [2009]	0.99	0.01	0.96	1.00	1	50380
Breeder fidelity [2010]	0.97	0.02	0.93	1.00	1	7536
Breeder fidelity [2011]	0.97	0.02	0.91	1.00	1	4285
Breeder fidelity [2012]	0.96	0.03	0.89	1.00	1	4017
Breeder fidelity [2013]	0.97	0.02	0.92	1.00	1	16063
Breeder fidelity [2014]	0.95	0.03	0.88	1.00	1	7032
Breeder fidelity [2015]	0.94	0.04	0.85	1.00	1	6165
Breeder fidelity [2016]	0.94	0.04	0.85	1.00	1	12410
Breeder fidelity [2017]	0.93	0.04	0.83	1.00	1	9319
Breeder fidelity [2018]	0.93	0.05	0.82	1.00	1	22169
Calf fidelity [1977]	0.50	0.29	0.02	0.97	1	300000
Calf fidelity [1978]	0.67	0.24	0.16	0.99	1	127109
Calf fidelity [1979]	0.50	0.29	0.02	0.97	1	212580
Calf fidelity [1980]	0.67	0.24	0.16	0.99	1	128690
Calf fidelity [1981]	0.75	0.19	0.29	0.99	1	104529
Calf fidelity [1982]	0.75	0.19	0.29	0.99	1	102260
Calf fidelity [1983]	0.83	0.14	0.48	1.00	1	83274
Calf fidelity [1984]	0.80	0.16	0.40	0.99	1	91336
Calf fidelity [1985]	0.83	0.14	0.48	1.00	1	84606
Calf fidelity [1986]	0.67	0.24	0.16	0.99	1	128052
Calf fidelity [1987]	0.83	0.14	0.48	0.99	1	83976
Calf fidelity [1988]	0.89	0.10	0.63	1.00	1	73839
Calf fidelity [1989]	0.75	0.19	0.29	0.99	1	103813

Calf fidelity [1990]	0.92	0.08	0.72	1.00	1	68158
Calf fidelity [1991]	0.80	0.16	0.40	0.99	1	90635
Calf fidelity [1992]	0.86	0.12	0.54	1.00	1	80110
Calf fidelity [1993]	0.80	0.16	0.40	0.99	1	89689
Calf fidelity [1994]	0.67	0.24	0.16	0.99	1	128190
Calf fidelity [1995]	0.75	0.19	0.29	0.99	1	102453
Calf fidelity [1996]	0.75	0.19	0.29	0.99	1	103845
Calf fidelity [1997]	0.90	0.09	0.67	1.00	1	70905
Calf fidelity [1998]	0.79	0.15	0.45	0.99	1	11588
Calf fidelity [1999]	0.50	0.29	0.03	0.98	1	210960
Calf fidelity [2000]	0.67	0.24	0.16	0.99	1	128397
Calf fidelity [2001]	0.50	0.29	0.02	0.98	1	213124
Calf fidelity [2002]	0.88	0.09	0.65	1.00	1	11809
Calf fidelity [2003]	0.87	0.11	0.59	1.00	1	75864
Calf fidelity [2004]	0.86	0.12	0.54	1.00	1	79452
Calf fidelity [2005]	0.86	0.12	0.54	1.00	1	80472
Calf fidelity [2006]	0.93	0.07	0.75	1.00	1	64322
Calf fidelity [2007]	0.77	0.16	0.39	0.99	1	12161
Calf fidelity [2008]	0.90	0.09	0.66	1.00	1	71638
Calf fidelity [2009]	0.92	0.08	0.71	1.00	1	68562
Calf fidelity [2010]	0.95	0.05	0.81	1.00	1	61426
Calf fidelity [2011]	0.90	0.09	0.66	1.00	1	71366
Calf fidelity [2012]	0.89	0.10	0.63	1.00	1	73444
Calf fidelity [2013]	0.75	0.19	0.29	0.99	1	103602
Calf fidelity [2014]	0.91	0.08	0.69	1.00	1	70270
Calf fidelity [2015]	0.50	0.29	0.03	0.98	1	212504
Calf fidelity [2016]	0.83	0.14	0.48	0.99	1	80439
Calf fidelity [2017]	0.89	0.10	0.63	1.00	1	73763
Calf fidelity [2018]	0.67	0.24	0.16	0.99	1	127600
Pre-breeder fidelity [1977]	0.50	0.29	0.03	0.97	1	300000
Pre-breeder fidelity [1978]	0.50	0.29	0.03	0.97	1	182798
Pre-breeder fidelity [1979]	0.68	0.23	0.17	0.99	1	112275
Pre-breeder fidelity [1980]	0.76	0.19	0.31	0.99	1	87834
Pre-breeder fidelity [1981]	0.83	0.14	0.48	0.99	1	68779
Pre-breeder fidelity [1982]	0.88	0.11	0.60	1.00	1	69066
Pre-breeder fidelity [1983]	0.90	0.09	0.65	1.00	1	67055
Pre-breeder fidelity [1984]	0.93	0.07	0.74	1.00	1	63861
Pre-breeder fidelity [1985]	0.94	0.06	0.79	1.00	1	62906
Pre-breeder fidelity [1986]	0.95	0.05	0.82	1.00	1	60982
Pre-breeder fidelity [1987]	0.93	0.06	0.77	1.00	1	20618
Pre-breeder fidelity [1988]	0.95	0.05	0.83	1.00	1	56647
Pre-breeder fidelity [1989]	0.96	0.03	0.87	1.00	1	47578
Pre-breeder fidelity [1990]	0.97	0.03	0.88	1.00	1	58926
Pre-breeder fidelity [1991]	0.94	0.05	0.82	1.00	1	6078
Pre-breeder fidelity [1992]	0.97	0.03	0.88	1.00	1	47210
Pre-breeder fidelity [1993]	0.96	0.03	0.88	1.00	1	20957

Pre-breeder fidelity [1994]	0.96	0.03	0.88	1.00	1	15109
Pre-breeder fidelity [1995]	0.98	0.02	0.91	1.00	1	57100
Pre-breeder fidelity [1996]	0.97	0.03	0.91	1.00	1	55825
Pre-breeder fidelity [1997]	0.92	0.05	0.80	1.00	1	3025
Pre-breeder fidelity [1998]	0.96	0.03	0.88	1.00	1	14990
Pre-breeder fidelity [1999]	0.98	0.02	0.92	1.00	1	56942
Pre-breeder fidelity [2000]	0.98	0.02	0.92	1.00	1	56784
Pre-breeder fidelity [2001]	0.97	0.03	0.90	1.00	1	57809
Pre-breeder fidelity [2002]	0.97	0.03	0.90	1.00	1	60210
Pre-breeder fidelity [2003]	0.97	0.02	0.91	1.00	1	56953
Pre-breeder fidelity [2004]	0.97	0.03	0.89	1.00	1	47552
Pre-breeder fidelity [2005]	0.98	0.02	0.92	1.00	1	58805
Pre-breeder fidelity [2006]	0.95	0.04	0.86	1.00	1	5605
Pre-breeder fidelity [2007]	0.94	0.04	0.85	1.00	1.01	2140
Pre-breeder fidelity [2008]	0.97	0.03	0.89	1.00	1	16386
Pre-breeder fidelity [2009]	0.97	0.03	0.89	1.00	1	12610
Pre-breeder fidelity [2010]	0.98	0.02	0.93	1.00	1	55114
Pre-breeder fidelity [2011]	0.98	0.02	0.93	1.00	1	14342
Pre-breeder fidelity [2012]	0.97	0.02	0.91	1.00	1	7216
Pre-breeder fidelity [2013]	0.97	0.02	0.92	1.00	1	16042
Pre-breeder fidelity [2014]	0.97	0.02	0.92	1.00	1	18541
Pre-breeder fidelity [2015]	0.98	0.02	0.92	1.00	1	30968
Pre-breeder fidelity [2016]	0.94	0.04	0.86	1.00	1	6618
Pre-breeder fidelity [2017]	0.97	0.02	0.91	1.00	1	41539
Pre-breeder fidelity [2018]	0.96	0.03	0.89	1.00	1	48732
Breeder recapture [1977]	0.60	0.23	0.19	0.98	1	18829
Breeder recapture [1978]	0.34	0.14	0.11	0.65	1	44503
Breeder recapture [1979]	0.50	0.13	0.27	0.77	1	33315
Breeder recapture [1980]	0.44	0.09	0.28	0.61	1	65082
Breeder recapture [1981]	0.60	0.07	0.45	0.74	1	90481
Breeder recapture [1982]	0.51	0.07	0.37	0.64	1	114667
Breeder recapture [1983]	0.31	0.06	0.20	0.44	1	130893
Breeder recapture [1984]	0.55	0.07	0.42	0.68	1	100281
Breeder recapture [1985]	0.52	0.06	0.39	0.64	1	101329
Breeder recapture [1986]	0.55	0.06	0.43	0.68	1	88923
Breeder recapture [1987]	0.46	0.06	0.35	0.59	1	89291
Breeder recapture [1988]	0.57	0.06	0.45	0.68	1	89996
Breeder recapture [1989]	0.56	0.06	0.44	0.67	1	87295
Breeder recapture [1990]	0.49	0.06	0.37	0.60	1	92115
Breeder recapture [1991]	0.44	0.06	0.33	0.55	1	102385
Breeder recapture [1992]	0.34	0.05	0.24	0.45	1	84542
Breeder recapture [1993]	0.34	0.06	0.23	0.45	1	53161
Breeder recapture [1994]	0.54	0.06	0.43	0.65	1	85930
Breeder recapture [1995]	0.63	0.05	0.53	0.74	1	107810
Breeder recapture [1996]	0.65	0.05	0.55	0.75	1	102343
Breeder recapture [1997]	0.70	0.05	0.60	0.80	1	88307

Breeder recapture [1998]	0.58	0.05	0.47	0.68	1	86622
Breeder recapture [1999]	0.64	0.05	0.53	0.74	1	107680
Breeder recapture [2000]	0.66	0.05	0.56	0.76	1	123521
Breeder recapture [2001]	0.75	0.05	0.65	0.83	1	115727
Breeder recapture [2002]	0.79	0.04	0.70	0.87	1	113625
Breeder recapture [2003]	0.84	0.04	0.76	0.91	1	114737
Breeder recapture [2004]	0.66	0.05	0.56	0.75	1	124043
Breeder recapture [2005]	0.84	0.04	0.76	0.91	1	148890
Breeder recapture [2006]	0.68	0.05	0.59	0.77	1	144436
Breeder recapture [2007]	0.88	0.03	0.81	0.94	1	155235
Breeder recapture [2008]	0.79	0.04	0.71	0.86	1	167851
Breeder recapture [2009]	0.86	0.03	0.79	0.92	1	157156
Breeder recapture [2010]	0.74	0.04	0.65	0.82	1	117582
Breeder recapture [2011]	0.84	0.04	0.77	0.91	1	129415
Breeder recapture [2012]	0.76	0.04	0.68	0.84	1	98297
Breeder recapture [2013]	0.61	0.05	0.51	0.70	1	104230
Breeder recapture [2014]	0.69	0.05	0.59	0.78	1	89941
Breeder recapture [2015]	0.59	0.05	0.49	0.69	1	75334
Breeder recapture [2016]	0.68	0.05	0.58	0.78	1	91256
Breeder recapture [2017]	0.86	0.04	0.77	0.93	1	91995
Breeder recapture [2018]	0.92	0.05	0.80	1.00	1	21109
Pre-breeder recapture [1977]	0.48	0.29	0.02	0.97	1	118638
Pre-breeder recapture [1978]	0.64	0.24	0.14	0.99	1	102260
Pre-breeder recapture [1979]	0.47	0.22	0.08	0.89	1	104979
Pre-breeder recapture [1980]	0.47	0.19	0.13	0.84	1	78767
Pre-breeder recapture [1981]	0.50	0.17	0.19	0.82	1	67565
Pre-breeder recapture [1982]	0.63	0.15	0.32	0.90	1	63077
Pre-breeder recapture [1983]	0.60	0.13	0.33	0.84	1	69879
Pre-breeder recapture [1984]	0.69	0.11	0.45	0.88	1	120665
Pre-breeder recapture [1985]	0.42	0.11	0.21	0.64	1	95908
Pre-breeder recapture [1986]	0.80	0.09	0.61	0.94	1	96568
Pre-breeder recapture [1987]	0.74	0.10	0.53	0.90	1	82776
Pre-breeder recapture [1988]	0.86	0.06	0.71	0.96	1	134062
Pre-breeder recapture [1989]	0.89	0.06	0.75	0.98	1	119116
Pre-breeder recapture [1990]	0.80	0.06	0.66	0.91	1	95291
Pre-breeder recapture [1991]	0.63	0.08	0.47	0.78	1	103587
Pre-breeder recapture [1992]	0.64	0.07	0.49	0.78	1	99155
Pre-breeder recapture [1993]	0.83	0.06	0.70	0.93	1	116769
Pre-breeder recapture [1994]	0.92	0.04	0.82	0.98	1	30417
Pre-breeder recapture [1995]	0.95	0.04	0.86	0.99	1	99499
Pre-breeder recapture [1996]	0.89	0.05	0.77	0.97	1	140402
Pre-breeder recapture [1997]	0.95	0.03	0.86	0.99	1	96911
Pre-breeder recapture [1998]	0.93	0.04	0.84	0.99	1	118813
Pre-breeder recapture [1999]	0.96	0.03	0.88	0.99	1	100255
Pre-breeder recapture [2000]	0.91	0.05	0.80	0.98	1	122707
Pre-breeder recapture [2001]	0.94	0.04	0.85	0.99	1	102223

Pre-breeder recapture [2002]	0.95	0.04	0.86	0.99	1	99039
Pre-breeder recapture [2003]	0.90	0.05	0.79	0.97	1	132194
Pre-breeder recapture [2004]	0.94	0.04	0.84	0.99	1	97019
Pre-breeder recapture [2005]	0.98	0.02	0.92	1.00	1	58146
Pre-breeder recapture [2006]	0.96	0.03	0.88	0.99	1	95632
Pre-breeder recapture [2007]	0.95	0.03	0.88	0.99	1	98519
Pre-breeder recapture [2008]	0.96	0.03	0.88	0.99	1	100120
Pre-breeder recapture [2009]	0.94	0.03	0.86	0.99	1	118582
Pre-breeder recapture [2010]	0.98	0.01	0.94	1.00	1	56337
Pre-breeder recapture [2011]	0.96	0.02	0.90	0.99	1	115520
Pre-breeder recapture [2012]	0.93	0.03	0.85	0.97	1	62096
Pre-breeder recapture [2013]	0.66	0.06	0.55	0.77	1	126240
Pre-breeder recapture [2014]	0.93	0.03	0.86	0.98	1	75922
Pre-breeder recapture [2015]	0.62	0.06	0.50	0.73	1	99424
Pre-breeder recapture [2016]	0.74	0.05	0.63	0.84	1	110910
Pre-breeder recapture [2017]	0.91	0.03	0.84	0.97	1	137560
Pre-breeder recapture [2018]	0.97	0.03	0.90	1.00	1	46593
Breeder recovery [1977]	0.50	0.29	0.03	0.98	1	299755
Breeder recovery [1978]	0.48	0.29	0.02	0.97	1	129108
Breeder recovery [1979]	0.48	0.29	0.02	0.97	1	112606
Breeder recovery [1980]	0.48	0.29	0.02	0.97	1	149228
Breeder recovery [1981]	0.48	0.29	0.02	0.97	1	138420
Breeder recovery [1982]	0.49	0.29	0.02	0.97	1	187108
Breeder recovery [1983]	0.49	0.29	0.02	0.97	1	194139
Breeder recovery [1984]	0.38	0.28	0.01	0.95	1	18421
Breeder recovery [1985]	0.46	0.29	0.02	0.97	1	127085
Breeder recovery [1986]	0.35	0.27	0.01	0.94	1	11756
Breeder recovery [1987]	0.41	0.28	0.01	0.96	1	37481
Breeder recovery [1988]	0.45	0.29	0.02	0.97	1	117887
Breeder recovery [1989]	0.56	0.26	0.10	0.98	1.01	20955
Breeder recovery [1990]	0.44	0.29	0.02	0.96	1	65043
Breeder recovery [1991]	0.43	0.29	0.02	0.96	1	56303
Breeder recovery [1992]	0.59	0.25	0.10	0.98	1	40217
Breeder recovery [1993]	0.33	0.27	0.01	0.93	1	11169
Breeder recovery [1994]	0.41	0.28	0.01	0.96	1	61488
Breeder recovery [1995]	0.42	0.28	0.02	0.96	1	49919
Breeder recovery [1996]	0.37	0.28	0.01	0.95	1	17498
Breeder recovery [1997]	0.46	0.26	0.06	0.96	1.01	6086
Breeder recovery [1998]	0.42	0.28	0.02	0.96	1	52008
Breeder recovery [1999]	0.60	0.23	0.16	0.98	1.01	12320
Breeder recovery [2000]	0.39	0.28	0.01	0.95	1	21947
Breeder recovery [2001]	0.39	0.28	0.01	0.95	1	23865
Breeder recovery [2002]	0.30	0.26	0.01	0.92	1.01	6637
Breeder recovery [2003]	0.45	0.26	0.06	0.96	1.04	5053
Breeder recovery [2004]	0.46	0.26	0.06	0.96	1.01	5392
Breeder recovery [2005]	0.67	0.22	0.20	0.99	1	57783

Breeder recovery [2006]	0.35	0.27	0.01	0.94	1	9507
Breeder recovery [2007]	0.33	0.27	0.01	0.93	1.01	6839
Breeder recovery [2008]	0.41	0.28	0.01	0.96	1	25156
Breeder recovery [2009]	0.46	0.29	0.02	0.97	1	147337
Breeder recovery [2010]	0.37	0.28	0.01	0.95	1	12823
Breeder recovery [2011]	0.52	0.24	0.11	0.97	1	3393
Breeder recovery [2012]	0.32	0.27	0.01	0.93	1	6224
Breeder recovery [2013]	0.37	0.28	0.01	0.95	1	22354
Breeder recovery [2014]	0.31	0.27	0.01	0.93	1	11007
Breeder recovery [2015]	0.38	0.26	0.04	0.94	1	5274
Breeder recovery [2016]	0.32	0.27	0.01	0.93	1	20945
Breeder recovery [2017]	0.42	0.25	0.06	0.95	1	8581
Breeder recovery [2018]	0.46	0.26	0.07	0.96	1	24476
Calf recovery [1977]	0.50	0.29	0.02	0.98	1	299790
Calf recovery [1978]	0.50	0.29	0.02	0.97	1	212689
Calf recovery [1979]	0.50	0.29	0.03	0.97	1	214082
Calf recovery [1980]	0.50	0.29	0.03	0.98	1	213864
Calf recovery [1981]	0.50	0.29	0.02	0.97	1	215585
Calf recovery [1982]	0.50	0.29	0.03	0.98	1	213420
Calf recovery [1983]	0.50	0.29	0.03	0.98	1	213345
Calf recovery [1984]	0.50	0.29	0.03	0.97	1	212692
Calf recovery [1985]	0.50	0.29	0.02	0.98	1	213313
Calf recovery [1986]	0.67	0.24	0.16	0.99	1	126046
Calf recovery [1987]	0.50	0.29	0.02	0.98	1	213907
Calf recovery [1988]	0.50	0.29	0.03	0.98	1	213579
Calf recovery [1989]	0.50	0.29	0.03	0.98	1	213431
Calf recovery [1990]	0.50	0.29	0.03	0.97	1	214182
Calf recovery [1991]	0.50	0.29	0.02	0.98	1	213354
Calf recovery [1992]	0.50	0.29	0.03	0.98	1	210147
Calf recovery [1993]	0.50	0.29	0.02	0.97	1	212022
Calf recovery [1994]	0.50	0.29	0.03	0.98	1	212722
Calf recovery [1995]	0.50	0.29	0.03	0.97	1	213365
Calf recovery [1996]	0.50	0.29	0.02	0.98	1	213296
Calf recovery [1997]	0.50	0.29	0.03	0.98	1	212608
Calf recovery [1998]	0.43	0.28	0.02	0.96	1	18733
Calf recovery [1999]	0.50	0.29	0.02	0.97	1	213370
Calf recovery [2000]	0.50	0.29	0.02	0.98	1	213962
Calf recovery [2001]	0.50	0.29	0.03	0.97	1	212944
Calf recovery [2002]	0.67	0.21	0.22	0.98	1	12580
Calf recovery [2003]	0.50	0.29	0.02	0.98	1	214028
Calf recovery [2004]	0.50	0.29	0.02	0.97	1	215559
Calf recovery [2005]	0.50	0.29	0.02	0.98	1	213020
Calf recovery [2006]	0.67	0.24	0.16	0.99	1	127023
Calf recovery [2007]	0.43	0.28	0.02	0.96	1	18428
Calf recovery [2008]	0.50	0.29	0.03	0.98	1	211161
Calf recovery [2009]	0.50	0.29	0.02	0.98	1	213733

Calf recovery [2010]	0.67	0.24	0.16	0.99	1	126783
Calf recovery [2011]	0.50	0.29	0.02	0.97	1	216303
Calf recovery [2012]	0.50	0.29	0.03	0.97	1	214438
Calf recovery [2013]	0.50	0.29	0.02	0.97	1	213717
Calf recovery [2014]	0.50	0.29	0.03	0.97	1	211844
Calf recovery [2015]	0.50	0.29	0.03	0.97	1	213150
Calf recovery [2016]	0.50	0.29	0.02	0.97	1	214059
Calf recovery [2017]	0.67	0.24	0.16	0.99	1	126859
Calf recovery [2018]	0.50	0.29	0.03	0.97	1	212615
Pre-breeder recovery [1977]	0.50	0.29	0.03	0.98	1	292972
Pre-breeder recovery [1978]	0.49	0.29	0.02	0.97	1	177239
Pre-breeder recovery [1979]	0.49	0.29	0.02	0.97	1	203506
Pre-breeder recovery [1980]	0.49	0.29	0.02	0.97	1	186324
Pre-breeder recovery [1981]	0.49	0.29	0.02	0.97	1	179278
Pre-breeder recovery [1982]	0.49	0.29	0.02	0.97	1	192978
Pre-breeder recovery [1983]	0.49	0.29	0.02	0.97	1	205042
Pre-breeder recovery [1984]	0.50	0.29	0.02	0.97	1	210774
Pre-breeder recovery [1985]	0.50	0.29	0.02	0.97	1	207586
Pre-breeder recovery [1986]	0.50	0.29	0.02	0.97	1	210170
Pre-breeder recovery [1987]	0.45	0.28	0.02	0.96	1	36417
Pre-breeder recovery [1988]	0.49	0.29	0.02	0.97	1	184856
Pre-breeder recovery [1989]	0.49	0.29	0.02	0.97	1	140455
Pre-breeder recovery [1990]	0.50	0.29	0.02	0.97	1	208960
Pre-breeder recovery [1991]	0.50	0.25	0.08	0.96	1	6341
Pre-breeder recovery [1992]	0.47	0.29	0.02	0.97	1	157252
Pre-breeder recovery [1993]	0.44	0.28	0.02	0.96	1	34956
Pre-breeder recovery [1994]	0.43	0.28	0.02	0.96	1	23871
Pre-breeder recovery [1995]	0.49	0.29	0.02	0.97	1	195263
Pre-breeder recovery [1996]	0.49	0.29	0.02	0.97	1	199013
Pre-breeder recovery [1997]	0.35	0.27	0.01	0.93	1	6153
Pre-breeder recovery [1998]	0.42	0.28	0.02	0.96	1	22411
Pre-breeder recovery [1999]	0.49	0.29	0.02	0.97	1	181621
Pre-breeder recovery [2000]	0.65	0.24	0.15	0.99	1	119247
Pre-breeder recovery [2001]	0.49	0.29	0.02	0.97	1	194329
Pre-breeder recovery [2002]	0.49	0.29	0.02	0.97	1	189437
Pre-breeder recovery [2003]	0.49	0.29	0.02	0.97	1	194558
Pre-breeder recovery [2004]	0.65	0.24	0.15	0.99	1	118061
Pre-breeder recovery [2005]	0.74	0.20	0.28	0.99	1	99281
Pre-breeder recovery [2006]	0.53	0.25	0.09	0.97	1	6326
Pre-breeder recovery [2007]	0.34	0.26	0.01	0.93	1.01	4640
Pre-breeder recovery [2008]	0.43	0.28	0.02	0.96	1	27252
Pre-breeder recovery [2009]	0.58	0.25	0.11	0.98	1	13231
Pre-breeder recovery [2010]	0.49	0.29	0.02	0.97	1	193510
Pre-breeder recovery [2011]	0.59	0.25	0.11	0.98	1	15034
Pre-breeder recovery [2012]	0.40	0.28	0.01	0.95	1	13984
Pre-breeder recovery [2013]	0.42	0.28	0.02	0.96	1	29737

Pre-breeder recovery [2014]	0.57	0.25	0.10	0.98	1	21279
Pre-breeder recovery [2015]	0.59	0.25	0.11	0.98	1	42920
Pre-breeder recovery [2016]	0.47	0.26	0.06	0.96	1	8048
Pre-breeder recovery [2017]	0.71	0.20	0.28	0.99	1	46895
Pre-breeder recovery [2018]	0.53	0.26	0.08	0.97	1	72680
Breeder true survival [1977]	0.50	0.29	0.02	0.98	1	297224
Breeder true survival [1978]	0.87	0.12	0.55	1.00	1	48039
Breeder true survival [1979]	0.92	0.07	0.73	1.00	1	43493
Breeder true survival [1980]	0.96	0.04	0.84	1.00	1	49822
Breeder true survival [1981]	0.97	0.03	0.91	1.00	1	42254
Breeder true survival [1982]	0.98	0.02	0.92	1.00	1	52051
Breeder true survival [1983]	0.98	0.02	0.93	1.00	1	54010
Breeder true survival [1984]	0.97	0.03	0.89	1.00	1	6908
Breeder true survival [1985]	0.98	0.02	0.92	1.00	1	40561
Breeder true survival [1986]	0.96	0.03	0.88	1.00	1.01	3938
Breeder true survival [1987]	0.97	0.02	0.91	1.00	1	13577
Breeder true survival [1988]	0.98	0.02	0.93	1.00	1	31353
Breeder true survival [1989]	0.96	0.02	0.90	1.00	1.01	15724
Breeder true survival [1990]	0.98	0.02	0.93	1.00	1	22880
Breeder true survival [1991]	0.98	0.02	0.93	1.00	1.01	18909
Breeder true survival [1992]	0.97	0.02	0.92	1.00	1	28840
Breeder true survival [1993]	0.97	0.03	0.89	1.00	1	3289
Breeder true survival [1994]	0.98	0.02	0.92	1.00	1	15746
Breeder true survival [1995]	0.98	0.02	0.94	1.00	1	15781
Breeder true survival [1996]	0.98	0.02	0.92	1.00	1	6261
Breeder true survival [1997]	0.96	0.03	0.90	1.00	1.01	3469
Breeder true survival [1998]	0.98	0.02	0.94	1.00	1	18637
Breeder true survival [1999]	0.96	0.02	0.90	0.99	1.01	11454
Breeder true survival [2000]	0.98	0.02	0.93	1.00	1	8170
Breeder true survival [2001]	0.98	0.02	0.94	1.00	1	8859
Breeder true survival [2002]	0.97	0.03	0.90	1.00	1.03	1874
Breeder true survival [2003]	0.96	0.03	0.90	1.00	1.08	3302
Breeder true survival [2004]	0.97	0.02	0.91	1.00	1.03	3504
Breeder true survival [2005]	0.97	0.02	0.93	0.99	1	48716
Breeder true survival [2006]	0.98	0.02	0.93	1.00	1	3327
Breeder true survival [2007]	0.98	0.02	0.93	1.00	1.01	3144
Breeder true survival [2008]	0.99	0.01	0.95	1.00	1	10674
Breeder true survival [2009]	0.99	0.01	0.97	1.00	1	42768
Breeder true survival [2010]	0.98	0.01	0.95	1.00	1	4345
Breeder true survival [2011]	0.96	0.02	0.91	0.99	1	2546
Breeder true survival [2012]	0.98	0.02	0.92	1.00	1	1643
Breeder true survival [2013]	0.98	0.02	0.94	1.00	1	6695
Breeder true survival [2014]	0.98	0.02	0.91	1.00	1.01	3224
Breeder true survival [2015]	0.96	0.03	0.87	1.00	1	2252
Breeder true survival [2016]	0.98	0.02	0.91	1.00	1	6150
Breeder true survival [2017]	0.94	0.04	0.85	0.99	1	5322

Breeder true survival [2018]	0.95	0.04	0.84	0.99	1	16042
Calf true survival [1977]	0.50	0.29	0.03	0.97	1	300000
Calf true survival [1978]	0.67	0.24	0.16	0.99	1	127312
Calf true survival [1979]	0.50	0.29	0.03	0.98	1	213191
Calf true survival [1980]	0.67	0.24	0.16	0.99	1	125486
Calf true survival [1981]	0.75	0.19	0.29	0.99	1	102956
Calf true survival [1982]	0.75	0.19	0.29	0.99	1	103586
Calf true survival [1983]	0.83	0.14	0.47	0.99	1	82724
Calf true survival [1984]	0.80	0.16	0.40	0.99	1	91830
Calf true survival [1985]	0.83	0.14	0.48	0.99	1	84042
Calf true survival [1986]	0.50	0.22	0.10	0.91	1	202951
Calf true survival [1987]	0.83	0.14	0.48	1.00	1	83515
Calf true survival [1988]	0.89	0.10	0.63	1.00	1	72164
Calf true survival [1989]	0.75	0.19	0.29	0.99	1	103383
Calf true survival [1990]	0.92	0.08	0.71	1.00	1	68040
Calf true survival [1991]	0.80	0.16	0.40	0.99	1	91002
Calf true survival [1992]	0.86	0.12	0.54	1.00	1	79686
Calf true survival [1993]	0.80	0.16	0.40	0.99	1	89367
Calf true survival [1994]	0.67	0.24	0.15	0.99	1	127002
Calf true survival [1995]	0.75	0.19	0.29	0.99	1	103550
Calf true survival [1996]	0.75	0.19	0.29	0.99	1	103448
Calf true survival [1997]	0.90	0.09	0.66	1.00	1	71534
Calf true survival [1998]	0.82	0.14	0.49	0.99	1	6919
Calf true survival [1999]	0.50	0.29	0.03	0.97	1	212547
Calf true survival [2000]	0.67	0.24	0.16	0.99	1	128985
Calf true survival [2001]	0.50	0.29	0.03	0.98	1	215156
Calf true survival [2002]	0.77	0.11	0.52	0.94	1	19219
Calf true survival [2003]	0.88	0.11	0.59	1.00	1	75059
Calf true survival [2004]	0.86	0.12	0.54	1.00	1	80353
Calf true survival [2005]	0.86	0.12	0.54	1.00	1	79547
Calf true survival [2006]	0.87	0.09	0.66	0.98	1	119230
Calf true survival [2007]	0.80	0.16	0.42	0.99	1	6451
Calf true survival [2008]	0.90	0.09	0.66	1.00	1	70784
Calf true survival [2009]	0.92	0.08	0.72	1.00	1	67714
Calf true survival [2010]	0.90	0.07	0.74	0.99	1	110930
Calf true survival [2011]	0.90	0.09	0.66	1.00	1	69601
Calf true survival [2012]	0.89	0.10	0.63	1.00	1	73669
Calf true survival [2013]	0.75	0.19	0.29	0.99	1	104030
Calf true survival [2014]	0.91	0.08	0.69	1.00	1	68927
Calf true survival [2015]	0.50	0.29	0.03	0.98	1	212736
Calf true survival [2016]	0.88	0.11	0.59	1.00	1	76380
Calf true survival [2017]	0.80	0.12	0.52	0.97	1	134192
Calf true survival [2018]	0.67	0.24	0.16	0.99	1	131173
Pre-breeder true survival [1977]	0.50	0.29	0.03	0.97	1	300197
Pre-breeder true survival [1978]	0.50	0.29	0.03	0.98	1	148267
Pre-breeder true survival [1979]	0.68	0.23	0.17	0.99	1	111266

Pre-breeder true survival [1980]	0.77	0.19	0.32	0.99	1	81787
Pre-breeder true survival [1981]	0.84	0.14	0.48	1.00	1	68607
Pre-breeder true survival [1982]	0.88	0.11	0.60	1.00	1	68078
Pre-breeder true survival [1983]	0.90	0.09	0.66	1.00	1	69290
Pre-breeder true survival [1984]	0.93	0.07	0.75	1.00	1	65449
Pre-breeder true survival [1985]	0.94	0.06	0.79	1.00	1	63312
Pre-breeder true survival [1986]	0.95	0.05	0.82	1.00	1	61838
Pre-breeder true survival [1987]	0.94	0.06	0.79	1.00	1	16030
Pre-breeder true survival [1988]	0.95	0.04	0.84	1.00	1	53833
Pre-breeder true survival [1989]	0.96	0.03	0.88	1.00	1	43685
Pre-breeder true survival [1990]	0.97	0.03	0.88	1.00	1	60126
Pre-breeder true survival [1991]	0.92	0.05	0.79	0.99	1.01	4589
Pre-breeder true survival [1992]	0.97	0.03	0.89	1.00	1	46280
Pre-breeder true survival [1993]	0.97	0.03	0.89	1.00	1	15356
Pre-breeder true survival [1994]	0.97	0.03	0.89	1.00	1	10610
Pre-breeder true survival [1995]	0.98	0.02	0.91	1.00	1	54180
Pre-breeder true survival [1996]	0.97	0.02	0.91	1.00	1	56742
Pre-breeder true survival [1997]	0.94	0.05	0.81	1.00	1.01	2083
Pre-breeder true survival [1998]	0.97	0.03	0.89	1.00	1	10888
Pre-breeder true survival [1999]	0.98	0.02	0.92	1.00	1	52013
Pre-breeder true survival [2000]	0.96	0.03	0.88	0.99	1	90118
Pre-breeder true survival [2001]	0.97	0.03	0.90	1.00	1	53450
Pre-breeder true survival [2002]	0.97	0.03	0.90	1.00	1	51874
Pre-breeder true survival [2003]	0.98	0.02	0.91	1.00	1	53009
Pre-breeder true survival [2004]	0.96	0.03	0.88	0.99	1	89482
Pre-breeder true survival [2005]	0.94	0.04	0.85	0.99	1	117666
Pre-breeder true survival [2006]	0.94	0.04	0.84	0.99	1	6157
Pre-breeder true survival [2007]	0.95	0.04	0.86	1.00	1.01	1694
Pre-breeder true survival [2008]	0.97	0.03	0.90	1.00	1	12893
Pre-breeder true survival [2009]	0.95	0.03	0.87	0.99	1	14787
Pre-breeder true survival [2010]	0.98	0.02	0.93	1.00	1	51159
Pre-breeder true survival [2011]	0.96	0.02	0.91	1.00	1	17858
Pre-breeder true survival [2012]	0.98	0.02	0.92	1.00	1	5272
Pre-breeder true survival [2013]	0.98	0.02	0.93	1.00	1	11553
Pre-breeder true survival [2014]	0.97	0.02	0.91	1.00	1	18046
Pre-breeder true survival [2015]	0.97	0.02	0.92	1.00	1	35032
Pre-breeder true survival [2016]	0.95	0.03	0.87	0.99	1	5194
Pre-breeder true survival [2017]	0.94	0.03	0.87	0.98	1	55837
Pre-breeder true survival [2018]	0.96	0.03	0.89	1.00	1	55492
Initial state assignment [Calf]	0.60	0.03	0.55	0.66	1	72757
Initial state assignment [Pre-breeder]	0.04	0.02	0.01	0.08	1	978
Initial state assignment [Breeder]	0.35	0.03	0.29	0.41	1	3568
Initial state assignment [Recovered Calf]	0.01	0.01	0.00	0.02	1	112048
Transition from Pre-breeder to Breeder (1977-1999)	0.08	0.01	0.06	0.10	1.1	633
Transition from Pre-breeder to Breeder (2000-2018)	0.04	0.01	0.03	0.06	1.02	1085

Uncertainty surrounding estimates of recovery probability was high across the majority of modelled years for all state (*Fig. S1*).

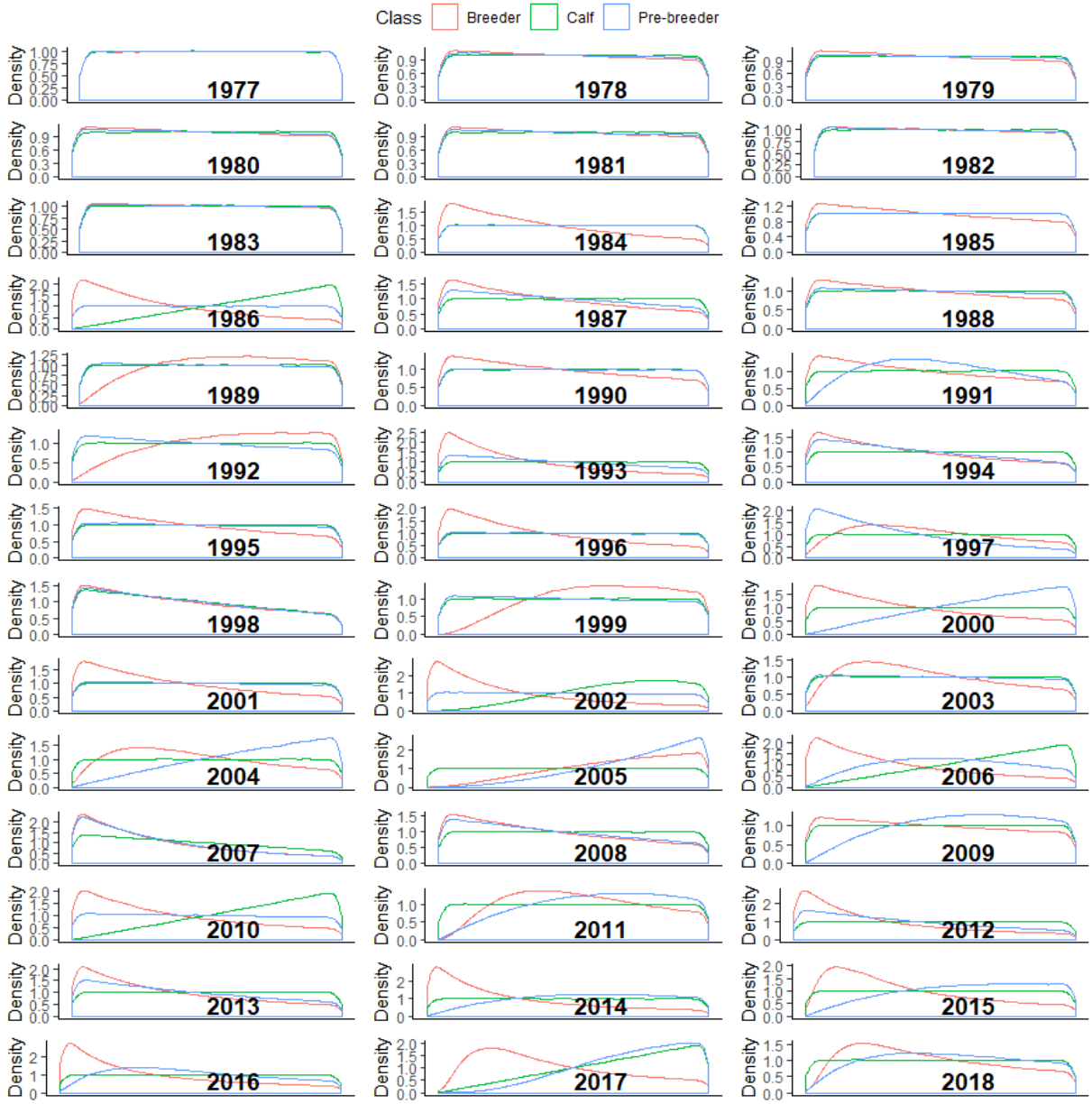

Figure S1. Yearly recovery probabilities for North Atlantic right whale calves (green), pre-breeders (blue) and breeders (red). X-axis represents the recovery probability with 0 on the left and 1 on the right, and the y-axis represents the density of values from the model.