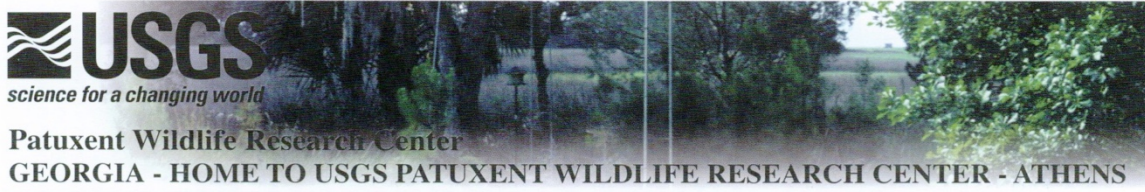Supplemental Figure S1. Flyer distributed to contacts in the coastal southeastern US states, The Bahamas and Cuba between 1999 and 2004, referencing Painted Bunting study.
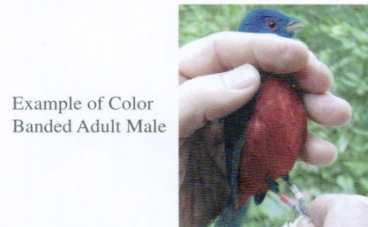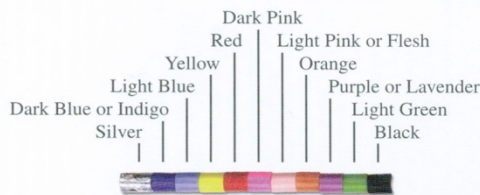
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REQUEST FOR SIGHTINGS OF COLOR BANDED PAINTED BUNTINGS

Background. The population of the Painted Bunting, a "species at risk" in the southeastern United States, has been declining at approximately 3% annually since 1966 based upon Breeding Bird Survey data. The cause or causes for this decline are not known but may be associated with fragmentation of eastern forest habitat, loss or significant alteration of optimum breeding habitat, increased predation, brood parasitism by the Brown-headed Cowbird, problem(s) on the wintering grounds (i.e., habitat loss, environmental contaminants, or trapping for cage birds), during migration, or other factors. The Painted Bunting depends on early successional habitat and is found breeding primarily in upland maritime shrub-scrub and edge habitats of the South Atlantic Coastal Plain from southeastern North Carolina south to northeastern Florida.

Information Needed. Biologists with the Biological Resources Division of the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center-Athens, located on the campus of the University of Georgia, are conducting studies of the Atlantic Coast population of the Painted Bunting to better understand movements, productivity, annual survival, and other aspects of the bird's biology. Painted Buntings are being captured using mist nets and are banded with colored leg bands from North Carolina to Florida for the next 5 years (1999 through 2003). Each marked bunting will have 4 bands--2 on each leg. Three of the bands are colored and one is silver (a USGS numbered aluminum band). In most cases, binoculars or a spotting scope will be required to see the leg bands and correctly determine band colors.

Each bunting has a unique combination of colored bands so that each individual bird can be identified. A given combination may have up to 3 of the same color or all may be a different color. Color bands being used are shown below about actual size.

Dark Pink
Red | Light Pink or Flesh
Yellow | Orange
Light Blue | Purple or Lavender
Dark Blue or Indigo | Light Green
Silver | Black

Example of Color Banded Adult Male

Another study in coastal Georgia uses only two bands, one on each leg; one silver and one band that has two colors (for example: white above red). Please report buntings with only two bands, also.

If you see a Painted Bunting with colored leg bands, please write down the band colors, and include the information shown below and on the attached form. Please mail the completed form to the address indicated at the bottom. Make additional copies of the form if needed.

˄ Color and location of each band on the bird's legs
(please make sure it is the bird's left and right legs, as in viewing a bird one can mistakenly reverse the legs; also, the bottom band is the one nearest the bird's toes):

| **LEFT TOP** | **RIGHT TOP** |
| **LEFT BOTTOM** | **RIGHT BOTTOM** |

˄ Note if bird's plumage is green or if it's a brightly colored male
˄ Location and date observed
˄ Your name, complete address, and telephone number

Your observations will help greatly increase our knowledge and understanding of the eastern population of the Painted Bunting. All reports will be acknowledged. For additional information, see the Patuxent Wildlife Research Center's Home page at http://www.pwrc.usgs.gov.

Thank you for your cooperation.

Sincerely,

Paul W. Sykes, Jr.
Wildlife Research Biologist
USGS Patuxent Wildlife Research Center
Warnell School of Forest Resources
The University of Georgia
Athens, GA 30602-2152
Phone: 706-542-1237

Adult Male

Green Plumage
(Female or Immature Male)

Department of the Interior
U.S. Geological Survey
Biological Resources Division

For more information, contact: Director
Patuxent Wildlife Research Center
12100 Beech Forest Rd., Laurel, Maryland 20708
(301) 497-5500   http://www.pwrc.usgs.gov

Supplemental Figure S2. Report form distributed to contacts in the coastal southeastern US states, The Bahamas and Cuba between 1999 and 2004, referencing Painted Bunting study.

REPORT FORM FOR COLOR BANDED PAINTED BUNTINGS

Please make sure to accurately record the colors (as given in accompanying sheet) and double-check to make sure you have not reversed the bird's left and right legs in recording the information. **Please print or type and spell out the colors**.

A.   BIRD'S LEFT LEG   BIRD'S RIGHT LEG

Color of top band_____   Color of top band_____

Color of bottom band_____   Color of bottom band_____

B. Color of plumage (circle which):   green   or   brightly colored male

C. Date of the observation:_____
                                         Month   Day   Year

D. Specific Locality:_____

            County:_____

            State or Country:_____

E. Your name:_____

      Your mailing address:_____

                              _____

                              _____

      Your telephone number:_____

      Your e-mail address:_____

Please mail to: Paul W. Sykes, Jr.   Telephone: 706-542-1237
                 USGS Patuxent Wildlife Research Center   or   Fax: 706-542-1235
                 Warnell School of Forest Resources   E-mail: Paul_Sykes@usgs.gov
                 The University of Georgia
                 Athens, GA 30602-2152
                 USA

Thank you for your cooperation.

Supplemental Material Appendix A. Example code used to fit a Cormack-Jolly-Seber model to capture histories for Painted Buntings banded and observed at 40 sites, 1999-2005. Code is modified from Kéry and Schaub (2012) and written for use in the software Just Another Gibbs Sampler (JAGS). In this model, annual apparent survival (phi) is estimated for each of three groups ("group": adult male, adult female, hatch-year), with group-specific effects of latitude and developed land use within 700 m ("dev.700") of the feeder where the individual was banded. Detection (p) is modeled as a function of binary covariates indicating years and feeders when effort comprised only a banding period ("banding_only"), extra observation hours ("extra_hrs"), or when a feeder was not visited ("nogo"). Random effect terms represent unexplained variation in survival among feeders ("epsilon[site]") and in detection among individuals ("epsilon.p").

```
HY.span<-c(0,seq(0.0001, 1, 0.0001)) #  values for estimating time in population, Hatch-year
ad.span<-seq(0.0001,30, 0.0001) # as above
n.occasions<-7   # 7 capture/recapture occasions, 1999-2005
sink("cjs-group-time.jags")
cat("
   model {
   # Priors and constraints
   for (i in 1:nind){
   for (t in f[i]:(n.occasions-1)){
        logit(phi[i,t])<-eta.phi[group[i,t], t]  + beta.700[group[i,t]]*dev.700[i] +
        beta.lat[group[i,t]]*latitude[i] + epsilon[site[i]]
        logit(p[i,t]) <- gamma.p + gamma.p.bo*banding_only[i,t] + gamma.p.xtra*extra_hrs[i,t] +
        gamma.p.nogo*nogo[i,t] + epsilon.p[i]
   } #t
} #i

#random effect for site
 for (s in 1:40){            # there were 40 feeders where birds were banded
   epsilon[s]~dnorm(0,tau.f)
   } #s
   sigma.f~dunif(0,10)
   tau.f<-pow(sigma.f,-2)
   sigma2.f<-pow(sigma.f,2)
```

```
# for survival parameters
   for (g in 1:3){
   for (t in 1:(n.occasions-1)){
   eta.phi[g,t] ~ dnorm(0, 0.37)I(-10, 10)        #prior for time and group specific survival; 3 groups
   phi.gr[g,t]<-1/(1+exp(-eta.phi[g,t]))  #mean survival for mean latitude, mean development
   } #t
   } #g

 for (g in 1:3){
   beta.700[g]~ dnorm(0, 0.37)I(-10, 10)
   beta.lat[g]~ dnorm(0, 0.37)I(-10, 10)
  }

 for (g in 1:3){
   phi.avg[g]<-mean(phi.gr[g,1:5])
   phi.avg.geom[g]<-exp(mean(log(phi.gr[g,1:5])))
}
   exp.life.adf<- (-1/log(phi.avg[1]))+1  # expected time in population, adult females
   exp.life.adm<- (-1/log(phi.avg[2]))+1# expected time in population, adult males
# estimate expected time in population for males banded as HY – prop.hym.surv.0 is proportional
# survival, age 0 to 1, 0.0001 time-step; sum.hym.prop.surv.0 is the proportion of HY males leaving
# the population in 1st year or at age 1; prop.hym.surv.ad is proportional survival as adults, age 1 to 30,
0.0001 time-step; exp.life.span is expected time in population, HY males
   prop.hym.surv.0<-(phi.avg[3]^HY.span)*((1-(phi.avg[3]^0.0001)))
   sum.hym.prop.surv.0<-sum(prop.hym.surv.0)
   prop.hym.surv.ad<-(1-sum.hym.prop.surv.0)*(phi.avg[2]^ad.span)*((1-(phi.avg[2]^0.0001)))
   sum.hym.prop.surv.ad<-sum(prop.hym.surv.ad)
  exp.life.hym<-(sum(prop.hym.surv.0*HY.span))+(sum(prop.hym.surv.ad*(ad.span+1)))
# repeat for HY females
   prop.hyf.surv.0<-(phi.avg[3]^HY.span)*((1-(phi.avg[3]^0.0001)))
   sum.hyf.prop.surv.0<-sum(prop.hyf.surv.0)  # prop HY f leaving population in 1st year or at year 1
   prop.hyf.surv.ad<-(1-sum.hyf.prop.surv.0)*(phi.avg[1]^ad.span)*((1-(phi.avg[1]^0.0001)))
   sum.hyf.prop.surv.ad<-sum(prop.hyf.surv.ad) #0.304  - proportion surviving more than 1 year
   exp.life.hyf<-(sum(prop.hyf.surv.0*HY.span))+(sum(prop.hyf.surv.ad*(ad.span+1)))

# for recapture parameters
   gamma.p ~ dnorm(0, 0.37)I(-10, 10)
   gamma.p.bo ~ dnorm(0, 0.37)I(-10, 10)
   gamma.p.xtra ~ dnorm(0, 0.37)I(-10, 10)
   gamma.p.nogo ~ dnorm(0, 0.37)I(-10, 10)
   p.mean<-1/(1+exp(-gamma.p))
   p.xtra<-1/(1+exp(-gamma.p-gamma.p.xtra))
   p.nogo<-1/(1+exp(-gamma.p-gamma.p.nogo))
   p.bo<-1/(1+exp(-gamma.p-gamma.p.bo))

#random effect of individual on detection
 for (i in 1:nind){
   epsilon.p[i]~dnorm(0, tau.p)
   }
```

```
    sigma.p~dunif(0,10)
    tau.p<-pow(sigma.p,-2)
    sigma2.p<-pow(sigma.p,2)

### set up post-predictive check
for (i in 1:nind){
    y_sim[i,f[i]]<-1
    }

 # Likelihood
    for (i in 1:nind){
    # Define latent state at first capture
    z[i,f[i]] <- 1
    for (t in (f[i]+1):n.occasions){

    # State process
    z[i,t] ~ dbern(mu1[i,t])
    mu1[i,t] <- phi[i,t-1] * z[i,t-1]
    # Observation process
    y[i,t] ~ dbern(mu2[i,t])
    mu2[i,t] <- p[i,t-1] * z[i,t]
# posterior predictive check
    y_sim[i,t]~ dbern(mu2[i,t])  #simulated obs for as many individuals as in data set, each date

    } #t
    ind.obs[i]<-sum(y[i,f[i]:n.occasions])     ### total number of years ind[i] seen
      ind.obs_sim[i]<-sum(y_sim[i,f[i]:n.occasions])
    ind.obs_exp[i]<-sum(mu2[i,(f[i]+1):n.occasions])+1  ### expected total
    depobs[i]<-pow((pow(ind.obs[i], 0.5)-pow(ind.obs_exp[i], 0.5)), 2)  # freeman-tukey measure of
 # departure from expected, observed data
    depsim[i]<-pow((pow(ind.obs_sim[i], 0.5)-pow(ind.obs_exp[i], 0.5)), 2)  # departure from expected,
# simulated data
    } #i

    PABUfit<- sum(depobs[]) #discrepancy, observed data
    PABUfit.sim<- sum(depsim[]) #discrepancy, simulated data
    }
    ",fill = TRUE)
sink()
```

Supplemental Material Appendix B. Cooperators who graciously provided research sites at their respective residences and maintained bird feeders at those sites during the course of all or part of a 18-year study of the eastern population of the Painted Bunting, and volunteers who assisted in various ways that mae this study possible, listed in alphabetical order.

Cooperators: R. A. and Jean Armellino, Harry and J. B. Baxley, E. A. Betbeze, D. J. and Maria Brown, Robert and Regina Cowgill, R. H. and C. S. Clark, L. E. Cribb, B. L. and O. T. Darby, R. D. and Dee Dyal, Allan Flock, E. B. Frech and Charlotte Dunlap, Nancy Garrison, G. S. Grant, R. H. Hayes, K. T. Kelso, S. T. and Dorothy Kilty, C. L. Lambert, Peter and Beryl LaMotte, Milton Levine, Dwight and Kim Lowell, George and Lynn Marra, C. P. Marsh, Gene and Ester Marshall, John and Susan Masaschi, C. L. and Sandra Maxwell, B. P. Moran, A. H. Morgan, Craig and Carolyn Morris, Bruce and Selena Patterson, Will and Kathy Post, Lillian Powell, Charles and Susan Schaller, D. L. Sheppard, S. H. Sernaker, and D. R. Tordona.

Volunteers: Morgan and Tera Baird, Harry and J. B. Baxley, T. A. Bean, William Berne, E. A. Betbeze, D. E. Bambach, D. J. Brown, J. D. Browning, R. M. Bryant, Danny Bystrak, Jim Cahill, W. S. Calver, Robert Cail, D. S. and A. D. Carter, J. E. Cely, D. D. Chafin, Diana Churchill, R. A. Churi, C. S. Clark, D. G. and D. A. Cohrs, Robert and Regina Cowgill, J. A. Cox, Aaron Crews, Linda Daniels, B. L. and O. T. Darby, L. B. Davenport, J. T. Davis, G. Q. Dean, Chris Depkin, D. R. Donaghy, Sam Drake, R. D. Dyal, Kristin Ebersol, M. A. Elfner, Allan Flock, D. A. Foster, J. B. French, Jr., J. O. Fussell III, Chad Garber, O. M. Garcia, George Garris, S. A. Gilje, Lex Glover, A. P. Gomez, J. M. Griess, L. M. Gravil, John Hammond, A. E. Hanigan, Fred Hardden, Dean Harrigal, L. P. Hartis, K. B. Hayes, Nancy Hickey, Charles Holcombe, Jill Howard, W. C. Hunter, D. H. Hurley, E. E. Iñigo-Elias, Cathy Japour, R. E. Joseph, John

Keinath, W. L. Kendall, C. B. Kepler, John Kilgo, Marianne Killackey, S. T. and Dorothy Kilty, Arturo Kirkconnell, Larry Klemik, K. T. Knapp, C. L. Lambert, A. R. and D. M. Leary, H. E. LeGrand, Jr., R. G. Miller, Milton Levine, Brian Loadholtz, C. A. Lombardo, Dwight and Kim Lowell, J. A. Lutmerding, Mary-Margaret Macgill, John McKenzie, Herbert Manigault, C. P. Marsh, John and Susan Masaschi, C. L. Maxwell, J. R. and P. E. Metz, J. M. Meyers, B. A. Millsap, C. T. Moore, B. P. Moran, J. C. Morris, P. E. and M. B. Mullhollan, A. K. Ochora, Karen Pacheco, E. E. Palmer, J. F. Parnell, Bruce and Selena Patterson, Robin Phyliky, A. O. Pifferrer, Pamela and Richard Poe, Arthur Poineau, Kathy Post, Gilbert Powell, Lillian Powell, Peggy Powell, B. J. Reece, J. R. Robinette, Yaroddys Rodriguez, T. R. Ruoff, Charles and Susan Schaller, D. L. Sheppard, Allison Sill, Becky Skiba, G. W. Smith, T. M. Schneider, Jeff Spratt, John Stiner, B. C. Stinson, Sandy Strickland, W. J. Sykes, T. G. Taylor, Daniel Tenney, Lydia Thompson, D. R. Tordona, John Townson, Bucko Turley, M. E. Urbanski, David Veljaeic, Maureen Watson, W. R. Webb, Stacy Welch, J. W. Wiley, E. J. Williams, Brad Winn, Jeffery Woods, D. S. Woodward, and many others.