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Data and R scripts to reproduce the analysis of the effect of climate and density on the survival, growth, reproduction, and seedling size of a fire-adapted carnivorous subshrub, the dewy pine (*Drosophyllum lusitanicum*), in three natural and five anthropogenic (i.e., highly human-dominated permanently disturbed sites) populations in southern Spain.

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Description

droso_anthropogenic.csv – This dataset contains individual demographic data collected annually in five anthropogenic populations of dewy pines (*Drosophyllum lusitanicum*) between 2016 and 2022 in southern Spain. The five populations (site) are: Sierra del Retín Disturbed (Retin), Prisioneros, Bujeo, Montera del Torero (MonteraTorero), and Sierra Carbonera Disturbed

(SCarbDist). For each individual (ID) at each capture, the data contains information on the site, transect, and sub-quadrat where the individual was found (site, transect, and subQuadrat, with quadratID the combination of transect and subQuadrat), the year (time) and time since fire in a categorical (TSF; >10) and numerical format (TSFcont, the standardized variable and TSFcont_unscaled, the non-standardized variable), as well as the size (size and size_unscaled, corresponding to the standardized and non-standardized size (log(number of leaves * length of the longest leaf)) in the current timestep, and sizeNext, the size in the next timestep) and the stage in the current and next timestep (stage and stageNext; SD = seedling, J = juvenile, SR = small reproductive individual, LR = large reproductive individual). In addition, the data contains information on whether an individual survived to the next year (surv; 1 if it survived, 0 if not), whether an individual flowered (fl; 1 if it flowered, 0 if not), and the number of flowering stalks and flowers per stalk (fs and fps), allowing to obtain the number of flowers (nbFlow = fs * fps). The dataset also contains values of aboveground density of large (size > 4.5) individuals (abLarge, the standardized variable of abLarge_unscaled; in individuals/m^2), and values of average minimum daily temperature (T) and cumulative rainfall (R) over various periods of the year: summer in the current year (May-September of the current year), fall in the current year (September-November of the current year), winter in the current year (January-April of the current year), fall and winter in the current year (fallwinter; September-April of the current year), winter in the previous year (prevwinter; January-April of the previous year), and fall in the previous year (prevfall; September-November of the previous year). The original, non-standardized values of these variables are in the _unscaled columns. This dataset is used to estimate survival and reproductive rates (flowering probability and number of flowers) as well as seedling size in anthropogenic dewy-pine populations, and assess the effects of rainfall, temperature and density on these vital rates.

`droso_natural.csv` – This dataset contains individual demographic data collected annually in three natural populations of dewy pines (*Drosophyllum lusitanicum*) between 2016 and 2022 in southern Spain. The three populations (site) are: Sierra del Retín Young (SierraRetinY5), Sierra Carbonera Young (SierraCarboneraY5), and Vertedero. For each individual (ID) at each capture, the data contains information on the site, transect, and sub-quadrat where the individual was found (site, transect, and subQuadrat, with quadratID the combination of transect and subQuadrat), the year (time) and time since fire in a categorical (TSF; 1-10 and >10) and numerical format (TSFcont, the standardized variable and TSFcont_unscaled, the non-standardized variable), as well as the size (size and size_unscaled, corresponding to the standardized and non-standardized size (log(number of leaves * length of the longest leaf)) in the current timestep, and sizeNext, the size in the next timestep) and the stage in the current and next timestep (stage and stageNext; SD = seedling, J = juvenile, SR = small reproductive individual, LR = large reproductive individual). In addition, the data contains information on whether an individual survived to the next year (surv; 1 if it survived, 0 if not), whether an individual flowered (fl; 1 if it flowered, 0 if not), and the number of flowering stalks and flowers per stalk (fs and fps), allowing to obtain the number of flowers (nbFlow = fs * fps). The dataset also contains values of aboveground density of large (size > 4.5) individuals (abLarge, the standardized variable of abLarge_unscaled; in individuals/m^2), and values of average maximum daily temperature (T) and cumulative rainfall (R) over various periods of the year: summer in the current year (May-September of the current year), fall in the current year (September-November of the current year), winter in the current year (January-April of the current year), fall and winter in the current year (fallwinter; September-April of the current year), winter in the previous year (prevwinter; January-April of the previous year), and fall in the previous year (prevfall; September-November of the previous year). The original, non-standardized values of these variables are in the _unscaled columns. This dataset is used to estimate survival and reproductive rates (flowering probability and number of flowers) as well as seedling size in anthropogenic dewy-pine populations, and assess the effects of rainfall, temperature and density on these vital rates.

droso_anthropogenic_full.csv – This dataset contains, in addition to the data in droso_anthropogenic_full.csv, data for the years since 2011 for Sierra del Retín Disturbed.

droso_natural_full.csv – This dataset contains, in addition to the data in droso_natural_full.csv, data for the years before 2016 in populations for which such data are available (i.e. 2011 for Vertedero, 2012 for Sierra Carbonera Young, and 2015 for Sierra del Retín Young).

droso_seedbank_anthropogenic.csv – This dataset contains data on the population-specific seedbank parameters for anthropogenic populations. We used previously published data from a seed-burial experiment in recently burned and long unburned dewy-pine habitats to estimate the proportion of seeds remaining in (staySB) or germinating from the seedbank (outSB). Additionally, we used data from a germination experiment on seeds from natural and anthropogenic habitats to estimate the proportion of seeds contributing to the seedbank (goSB) or germinating continuously (goCont).

droso_seedbank_natural.csv – This dataset contains data on the seedbank parameters for each year following a fire (time since fire; TSF_0-TSF_5) for all natural populations. We used previously published data from a seed-burial experiment in recently burned and long unburned dewy-pine habitats to estimate the proportion of seeds remaining in (staySB) or germinating from the seedbank (outSB). Additionally, we used data from a germination experiment on seeds from natural and anthropogenic habitats to estimate the proportion of seeds contributing to the seedbank (goSB) or germinating continuously (goCont).

CanESM5_MonthlyClimateProjection_RCP45.csv – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the CanESM5 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`CanESM5_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the CanESM5 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`EC_Earth3_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the EC_Earth3 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`EC_Earth3_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the EC_Earth3 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`FGOALS_G3_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the FGOALS_G3 projection model. We obtained the projected data from the Coupled

Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`FGOALS_G3_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the FGOALS_G3 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`GFDL_ESM4_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the GFDL_ESM4 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

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`GISS_E2_1_G_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the GISS_E2_1_G projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

GISS_E2_1_G_MonthlyClimateProjection_RCP85.csv – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the GISS_E2_1_G projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

INM_CM4_8_MonthlyClimateProjection_RCP45.csv – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the INM_CM4_8 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

INM_CM4_8_MonthlyClimateProjection_RCP85.csv – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the INM_CM4_8 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

IPSL_CM6A_LR_MonthlyClimateProjection_RCP45.csv – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the IPSL_CM6A_LR projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

IPSL_CM6A_LR_MonthlyClimateProjection_RCP85.csv – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the

IPSL_CM6A_LR projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`MIROC6_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the MIROC6 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`MIROC6_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the MIROC6 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`MPI_ESM1_2_LR_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the MPI_ESM1_2_LR projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`MPI_ESM1_2_LR_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the MPI_ESM1_2_LR projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`MRI_ESM2_0_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the MRI_ESM2_0 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`MRI_ESM2_0_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the MRI_ESM2_0 projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`NorESM2_MM_MonthlyClimateProjection_RCP45.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP4.5 scenario of the NorESM2_MM projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`NorESM2_MM_MonthlyClimateProjection_RCP85.csv` – This dataset contains projected monthly data on cumulative rainfall and average maximum daily temperature for each population according to the RCP8.5 scenario of the NorESM2_MM projection model. We obtained the projected data from the Coupled Model Intercomparison Project 6 (CMIP6) available from the Earth System Grid Federation (available at https://aims2.llnl.gov/search).

`01_Survival_GAMs_Anthropogenic.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv) to estimate survival using binomial generalized additive models (GAMs). We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5) and size in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (Survival_GAM_Anthropogenic.RData).

`01_Survival_GAMs_Natural.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv) to estimate survival using binomial generalized additive models (GAMs). We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5), size, and the number of years since the last fire (TSF; time since fire) in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (Survival_GAM_Natural.RData).

`01_Growth_GAMs_Anthropogenic.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv) to estimate growth rate using generalized additive models (GAMs) with a scaled *t* distribution. We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5) and size in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (Growth_GAM_Anthropogenic.RData).

`01_Growth_GAMs_Natural.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv) to estimate growth rate using generalized additive models (GAMs) with a scaled *t* distribution. We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5), size, and the number of years since the last fire (TSF; time since fire) in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (Growth_GAM_Natural.RData).

`01_FloweringProbability_GAMs_Anthropogenic.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv) to estimate flowering probability using binomial generalized additive models (GAMs). We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5) and size in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (FloweringProb_GAM_Anthropogenic.RData).

`01_FloweringProbability_GAMs_Natural.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv) to estimate flowering probability using binomial generalized additive models (GAMs). We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5), size, and the number of years since the last fire (TSF; time since fire) in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (FloweringProb_GAM_Natural.RData).

01_NumberFlowers_GAMs_Anthropogenic.R – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv) to estimate the number of flowers per individual using negative binomial generalized additive models (GAMs). We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5) and size in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (NbFlowers_GAM_Anthropogenic.RData).

01_NumberFlowers_GAMs_Natural.R – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv) to estimate the number of flowers per individual using negative binomial generalized additive models (GAMs). We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5), size, and the number of years since the last fire (TSF; time since fire) in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (NbFlowers_GAM_Natural.RData).

01_SeedlingSize_GAMs_Anthropogenic.R – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv) to estimate seedling size using generalized additive models (GAMs) with a scaled *t* distribution. We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5) in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (SeedlingSize_GAM_Anthropogenic.RData).

`01_SeedlingSize_GAMs_Natural.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv) to estimate seedling size using generalized additive models (GAMs) with a scaled *t* distribution. We first selected the best model among several ones including rainfall and temperature in different periods of the year, we then included density of large individuals (size > 4.5) and the number of years since the last fire (TSF; time since fire) in the model selection. We selected the best model using the AIC. We also included random time and population effects. At the end of the script, the best model is saved as an .RData object (SeedlingSize_GAM_Natural.RData).

`011_VitalRateProjections_Figures.R` – This script uses the individual capture-recapture data on the anthropogenic and natural dewy-pine populations (droso_anthropogenic.csv and droso_natural.csv) and the vital-rate models to predict and plot changes in vital rates with climatic variables (rainfall and temperature), density, size, and time since fire. The figures used in the manuscript are saved as .png files.

`021_ModelValidation_AnthropogenicPopulations.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project population dynamics using an IBM to validate the IBM structure and parameterization by comparing observed and projected aboveground population size, mean change in aboveground abundance, which we store in ValidationResults_Anthropogenic.csv, and size distribution, stored in SizeDistribution_Anthropogenic.csv.

`022_ModelValidation_NaturalPopulations.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project population dynamics using an IBM to validate the IBM structure and parameterization by comparing observed and projected aboveground population size, mean change in aboveground abundance, which we store in ValidationResults_Natural.csv, and size distribution, stored in SizeDistribution_Natural.csv.

`023_ModelValidation_Results.R` – This script uses the results from the model validation projections (ValidationResults_Anthropogenic.csv, ValidationResults_Natural.csv, SizeDistribution_Anthropogenic.csv, SizeDistribution_Natural.csv) to plot these results. The plots are stored in .png files.

`031_IBM_Anthropogenic_ClimateChange_RCP45_Bujeo.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Bujeo population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`031_IBM_Anthropogenic_ClimateChange_RCP85_Bujeo.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Bujeo population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`032_IBM_Anthropogenic_ClimateChange_RCP45_MonteraTorero.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Montera del Torero population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`032_IBM_Anthropogenic_ClimateChange_RCP85_MonteraTorero.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Montera del Torero population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`033_IBM_Anthropogenic_ClimateChange_RCP45_Prisioneros.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Prisioneros population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`033_IBM_Anthropogenic_ClimateChange_RCP85_Prisioneros.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Prisioneros population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`034_IBM_Anthropogenic_ClimateChange_RCP45_Retin.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra del Retín Disturbed population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`034_IBM_Anthropogenic_ClimateChange_RCP85_Retin.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra del Retín Disturbed population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`035_IBM_Anthropogenic_ClimateChange_RCP45_SCarbDist.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra Carbonera Disturbed population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`035_IBM_Anthropogenic_ClimateChange_RCP85_SCarbDist.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations from 2016 to 2022 (droso_anthropogenic.csv), the additional data available before 2016 (droso_anthropogenic_full.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra Carbonera Disturbed population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`036_IBM_Natural_ClimateChange_RCP45_SierraCarboneraY5.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra Carbonera Young population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`036_IBM_Natural_ClimateChange_RCP85_SierraCarboneraY5.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra Carbonera Young population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`037_IBM_Natural_ClimateChange_RCP45_SierraRetinY5.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra del Retín Young population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`037_IBM_Natural_ClimateChange_RCP85_SierraRetinY5.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Sierra del Retín Young population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`038_IBM_Natural_ClimateChange_RCP45_Vertedero.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Vertedero population under a control scenario and 11 climate-change projection models under the RCP 4.5 scenario using an IBM to obtain data on average changes in aboveground population,

population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects.

`038_IBM_Natural_ClimateChange_RCP85_Vertedero.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations from 2016 to 2022 (droso_natural.csv), the additional data available before 2016 (droso_natural_full.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models. In this script, we project the dynamics of the Vertedero population under a control scenario and 11 climate-change projection models under the RCP 8.5 scenario using an IBM to obtain data on average changes in aboveground population, population growth rate, and extinction probabilities. We store the results for each control and climate-change scenario in .RData objects

`039_IBM_Results.R` – This script uses the results of the IBM projections for anthropogenic and natural populations to process these results, which are stored in a .csv file (IBM_Results.csv). We also calculate the stochastic growth rate and mean extinction rate per population and scenario (control or climate change). The plots showing the results are savec as .png files.

`041_IBM_Anthropogenic_ClimateChange_SensitivityAnalysis_Bujeo.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Bujeo population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

042_IBM_Anthropogenic_ClimateChange_SensitivityAnalysis_MonteraTorero.R – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Montera del Torero population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

043_IBM_Anthropogenic_ClimateChange_SensitivityAnalysis_Prisioneros.R – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Prisioneros population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

044_IBM_Anthropogenic_ClimateChange_SensitivityAnalysis_Retin.R – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Sierra del Retín Disturbed population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

`045_IBM_Anthropogenic_ClimateChange_SensitivityAnalysis_SCarbDist.R` – This script uses the individual capture-recapture data on the five anthropogenic dewy-pine populations (droso_anthropogenic.csv), the data on seedbank parameters (droso_seedbank_anthropogenic.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Sierra Carbonera Disturbed population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

`046_IBM_Natural_ClimateChange_SensitivityAnalysis_SierraCarboneraY5.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Sierra Carbonera Young population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

`047_IBM_Natural_ClimateChange_SensitivityAnalysis_SierraRetinY5.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Sierra del

Retín Young population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

`048_IBM_Natural_ClimateChange_SensitivityAnalysis_Vertedero.R` – This script uses the individual capture-recapture data on the three natural dewy-pine populations (droso_natural.csv), the data on seedbank parameters (droso_seedbank_natural.csv), climate data, and the vital-rate models to project the populations and obtain the sensitivity of population dynamics to various vital rates under climate change. We projected the Vertedero population by assigning values from climate-change scenarios to climatic variables for specific vital rates only, while assuming current climatic conditions in the remaining vital rates. The projection results are stored in .RData files.

`049_SensitivityAnalysis.R` – This script uses the results of the IBM projections for anthropogenic and natural populations assessing the sensitivity of population dynamics to various vital rates under climate change to process these results, which are stored in a .csv file (ProcessedSensitivityResults.csv). The plots showing the results are savec as .png files. We calculate the mean sensitivity value per population and perturbed vital rate and plot the results. The plots are stored in .png files.