1   *METADATA FOR:*

2   **Demography of the understory herb *Heliconia acuminata* (Heliconiaceae) in an**

3   **experimentally fragmented tropical landscape**

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16   *Open Research Statement*: Data are available as Supporting Information and are also

17   available in Dryad at https://doi.org/------

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<p style="text-align:center;">**METADATA**</p>

I. CLASS I. Data Set Descriptors

A. Data set identity: Demographic data from populations of the understory herb *Heliconia acuminata* (Heliconiaceae) in an experimentally fragmented tropical landscape (1997-2009).

B. Data set identification code:

1. Data set File 1: `HDP_plots.csv`
2. Data set File 2: `HDP_1997_2009.csv`

C. Data set description:

1. **Originators:** Emilio M. Bruna, Department of Wildlife Ecology and Conservation, University of Florida, PO Box 110430, Gainesville, FL 32611-0430, USA and Center for Latin American Studies, University of Florida, PO Box 115530, Gainesville, FL 32611, USA.

2. **Abstract:** Habitat fragmentation is thought to be a leading cause of extinction, but the demography of species in fragmented landscapes remains poorly understood. This is particularly true in tropical ecosystems, where studies monitoring populations of species in both fragments and areas of continuous habitat across all life-history stages are virtually nonexistent. Here we report 12 years (1997-2009) of annual censuses of 13 populations of the Amazonian understory herb *Heliconia acuminata* (LC Rich.). These surveys were conducted in plots established in the experimentally fragmented landscape of the Biological Dynamics of Forest Fragments Project, located north of Manaus, Brazil. The plots, each 50×100m, are located in forest fragments of different sizes (N = 4 plots in 1-ha fragments and N = 3 plots in 10-ha fragments) as well as continuous forest (N = 6 plots). The population in each plot was censused annually, at

which time we recorded, identified, marked, and measured new seedlings, identified any

previously marked plants that had died, and recorded the size of individuals that

survived. During the flowering season we conducted regular surveys to recorded the

identity of flowering plants and the number of inflorescences each produced. The

resulting data set comprises >67000 plant×year records of 8586 plants, including 3464

seedlings that became established after the initial census. These data have been used

in publications on topics ranging from how fragmentation-related reductions in

germination influence population dynamics to tests of statistical methods for analyzing

reproductive rates (see *Class V Supplemental Descriptors*, below) .

D. Key words: Amazon, Brazil, deforestation, demography, edge effects, flowering, forest

fragments, habitat fragmentation, integral projection models, matrix models, population

dynamics, vital rates.

CLASS II. RESEARCH ORIGIN DESCRIPTORS

A. Overall project description:

1. **Identity:** The *Heliconia* Demography Project

2. **Originators:** Emilio M. Bruna, W. John Kress, and María Uriarte

3. **Period of study:** 1997-2009

4. **Objectives:** Habitat fragmentation continues to be a major focus of research by

ecologists (Didham et al. 2012, Haddad et al. 2015, Brudvig et al. 2017, Resasco et al.

2017, Fletcher et al. 2018) decades after it was first identified as a threat to the

integrity of ecosystems (Harris 1984, Wilcove et al. 1986). A large body of empirical

research has documented myriad biotic changes associated with fragmentation,

including the local extinction of plant species from fragments (Harrison and Bruna

1999, Laurance et al. 2011). Although the demographic mechanisms underlying these

extinctions are rarely known (Bruna et al. 2009), they are often hypothesized to result from reduced rates of individual growth, reproduction, or survivorship in fragments (Laurance et al. 1998, Zartman et al. 2015). This is especially true in tropical forest fragments, where abiotic conditions can be dramatically different from those in primary forest (reviewed in Broadbent et al. 2008). Tests of this hypothesis remain limited, however, by the paucity of long-term demographic data collected in both tropical forest fragments and continuous forest sites (Bruna et al. 2009).

Most studies investigating the effects of forest fragmentation on tropical plants focus on trees (Cordeiro et al. 2009, Jurinitz et al. 2013, Zambrano and Salguero-Gómez 2014), in part because they are major reservoirs of carbon (Slik et al. 2010, Lasky et al. 2014). However, herbaceous species can comprise up to 30% of the plant species in lowland tropical forests (Gentry and Emmons 1987, Ribeiro et al. 2010, Iannone and Vargas 2022, Spicer et al. 2022), where they are habitat and food for myriad animal taxa and economically and culturally vital non-timber forest products (Nakazono et al. 2004, Athayde et al. 2006). Despite their biocultural importance, however, the way in which habitat fragmentation and other global change phenomena influences the population dynamics of tropical understory plants remains conspicuously understudied (Bruna et al. 2009).

The *Heliconia* Demography Project (HDP) was established to address the lack of data on the demography of understory plants in fragmented tropical landscapes. The core of the HDP is annual censuses of thirteen populations of *Heliconia acuminata* located in either continuous forest or experimentally isolated forest fragments at Brazil's Biological Dynamiocs of Forest Fragments Project (Laurance et al. 2011) The primary purpose behind their initial collection was to parameterize size-structured demographic models (Caswell 2000, Ellner and Rees

93   2006) with which to (1) compare the demography and population dynamics of *H.*

94   *acuminata* populations in fragments and continuous forest, and (2) test the

95   hypothesis that reductions in seedling establishment in forest fragments would

96   lead to population declines.

97   5. **Abstract:** Here we report 12 years (1997-2009) of annual censuses of 13 populations

98   of the Amazonian understory herb *Heliconia acuminata* (LC Rich.). These surveys

99   were conducted in plots established in the experimentally fragmented landscape of the

100 Biological Dynamics of Forest Fragments Project, located north of Manaus, Brazil.

101 The plots, each 50×100m, are located in forest fragments of different sizes (N = 4

102 plots in 1-ha fragments and N = 3 plots in 10-ha fragments) as well as continuous

103 forest (N = 6 plots). The population in each plot was censused annually, at which time

104 we recorded identified, marked, and measured new seedlings, identified any previously

105 marked plants that had died, and recorded the size of individuals that survived.

106 During the flowering season we conducted regular surveys to recorded the identity of

107 flowering plants and the number of inflorescences each produced. The resulting data

108 set comprises >67000 plant×year records of N = 8586 plants, including N = 3464

109 seedlings that became established after the initial census. These data have been used

110 in publications on topics ranging from how fragmentation-related reductions in

111 germination influence population growth rates to tests of statistical methods for

112 analyzing reproductive rates.

B. Subproject description

1. **Site description**

a. **Site type:** Lowland tropical forest

b. **Geography:** The data were collected at the Biological Dynamics of Forest Fragments Project (BDFFP, 2°30'S, 60°W), a 1000-km mosaic of lowland forest, forest fragments, secondary forests, and pastures located approximately 70 km north of Manaus, Amazonas, Brazil (Fig. 1).

c. **Habitat:** The BDFFP is dominated by tropical evergreen lowland forest (i.e., 'tropical moist forest', *sensu* Holdridge (1967). The forest canopy at the sites is ~35–40 m tall, with emergent trees of up to ~45 m (Rankin-de-Mérona et al. 1992). The tree community at the BDFFP is highly diverse: ~1300 species total (Laurance 2001), with as many as 280 tree species ha^{-1} (Oliveira and Mori 1999). The understory is dominated by stemless palms (Scariot 1999). All HDP plots are located in *terra-firme* (i.e., non-flooded) forest and none are bisected by streams.

d. **Geology:** Soils in the sites are nutrient-poor xanthic ferralsols, known as yellow latosols in the Brazilian soil classification system. Despite their high clay content they have poor water-retention capacity (Fearnside and

Leal-Filho 2001). The often rugged topography at the BDFFP ranges in elevation from 50-150 m elevation (Gascon and Bierregaard 2001).

e. **Watersheds:** The BDFFP landscape includes catchments of the Urubu, Cuieiras, and Preto da Eva rivers (Nessimian et al. 2008).

f. **Site history:** A complete history of the BDFFP can be found in Gascon and Bierregaard (2001) and Bierregaard et al. (2002). Briefly, the BDFFP reserves were established on three cattle ranches. Fragments were isolated between 1980-1984 by felling the trees surrounding the patch of forest to be isolated (Lovejoy et al. 1986). Fragment reserves were fenced to prevent the incursion of cattle from the surrounding pastures. To ensure fragments remain isolated, a 100m strip around each fragment is regularly cleared of the secondary growth (Gascon and Bierregaard 2001). The structure and species composition of the secondary growth that surrounds a fragment, which is strongly dependent on whether fire was used to clear land prior to planting pasture grasses (Mesquita et al. 2001), can have large effects on the species composition, ecological processes, and abiotic conditions in fragments (reviewed in Laurance et al. 2002, 2011). The BDFFP is currently administered collaboratively by the Smithsonian Tropical Research Institute and Brazil's Instituto Nacional de Pesquisas da Amazônia (INPA).

g. **Climate:** Mean annual temperature at the site is 26°C (range 19-39°C). Annual rainfall ranges from 1900-2300 mm (Scott et al. 2022), with a pronounced dry season from June-December in which there is <100 mm rain per month.

2. **Sampling Design**

a. **Design characteristics**: Annual demographic surveys of *Heliconia*

168   *acuminata* populations were carried out in 13 permanent plots distributed

169   across the BDFFP landscape (Bruna and Kress 2002). Six plots are located

170   in continuous forest, four in 1-ha fragments, and three in 10-ha fragments

171   (one plot per fragment; Fig. 1).

172   *Heliconia acuminata* (Heliconiaceae) is a perennial, self-incompatible

173   monocot native to Amazonia (Kress 1990) and widely distributed

174   throughout the Amazon basin (Kress 1990). Although many species of

175   *Heliconia* grow in large aggregations on roadsides, gaps, and in other

176   disturbed habitats, others, including *H. acuminata*, grow primarily in

177   the shaded forest understory (Kress 1983). *Heliconia acuminata* is the

178   most abundant understory herb throughout much of the BDFFP

179   (Ribeiro et al. 2010); the other two *Heliconia* species found in the

180   BDFFP reserves are either very rare (*H. latispatha*) and restricted

181   saturated soils adjacent to streams (*H. tarumaensis*).

182   Each *Heliconia acuminata* has a basal rhizome from which emerge

183   erect vegetative shoots with broad leaves. Reproductive plants have

184   one or more flowering shoots, each of which has a single infloresence.

185   Plants grow slowly (Bruna and Ribeiro 2005, Gagnon et al. 2011) and

186   the proportion of plants that flower is low (Bruna 2002, Bruna and

187   Kress 2002). The primary herbivores of *Heliconia* species are Hispine

188   beetles, whose larvae and adults scrape the surface of unrolled

189   immamture leaves (Strong 1977). The beetle species associated with *H.*

190   *acuminata* is *Cephaloleia nigriceps* Baly (Staines and Garcia-Robledo

191   2014); it actually does little damage to leaves but can cause extensive

192   damage to bracts, flowers, and developing ovaries.

193   *Heliconia* can be propagated by segmenting the rhizome (Berry and

Kress 1991, Bruna and Andrade 2011), and clonal spread is common in the *Heliconia* species found in open or disturbed habitats (Schleuning et al. 2008). However, recruitment in *H. acuminata* and other understory species is primarily via seeds (Bruna 1999, 2002). Plants that flower do so during the rainy season, with the propbability of flowering increasing with plant size (Bruna and Kress 2002). The overwhelming majority of plants in our data set that flowered (75%) produced a single infloresence (range = 1-7). Infloresences have an average 22.28 ± 1.17 SE flowers (range 4-62); each flower remains open for one day before falling from the plant. Pollen transfer experiments indicate self-compatibility is extremely low (Bruna and Darrigo, *unpubl. data*); succesfully pollinated flowers can produce 1-3 seeds, with an average of 2 seeds per fruit (Bruna 2014).

Heliconia acuminata is pollinated by the 'traplining' hummingbirds *Phaeothornis superciliosus* and *P. bourcieri*. Visitation rates to flowers are extremely low (<1 visit hour^{-1}, Bruna et al. 2004), as are rates of fruit production (Bruna and Kress 2002). The fleshy blue fruits are consumed by birds (Uriarte et al. 2011); in our study sites the primary dispersers are the White-necked Thrush (*Turdus albicollis*), the Thrush-like-Manakin (*Schiffornis turdinus*), and several species of manakin (*Pipra erythrocephala, P. pipra, Lepidothrix serena*, and *Corapipo gutturalis*). The seeds germinate 6-7 months after dispersal, which coincides with the onset of the rainy season (Bruna 1999, 2002). Experiments indicate that post-dispersal seed predation is negligible and while rates of seed germination and seedling establishment were generally low, they were significantly higher in continuous forest than forest fragments (Bruna 1999, 2002). Although some seeds germinated

221   >1 year after experimental dispersal, this was generally rare -

222   especially in fragments. These results are consistent with the

223   generalization that few plant species in lowland tropical forests have

224   long-lived seed banks (Vázquez-Yanes and Orozco-Segovia 1993).

225   b. **Permanent Plots:** Each demographic plot is 50×100m and is subdivided

226   into 50 contiguous subplots of 10×10m to facilitate the surveys. Plots in

227   1-ha fragments were established in a randomly selected half of the fragment,

228   plots in 10-ha fragments are located in the center of the fragment, and plots

229   in continuous forest are located 500-4000 m from any borders with cattle

230   pastures or secondary forest (Fig. 2). The plots furthest apart are from

231   each other are separated by ~70 km.

232   Plots in 1-ha fragments, 10-ha fragments, and three of the continuous

233   forest sites were demarcated in January-April 1997. The remaining

234   three plots in continuous forest were demarcated in January 1998,

235   which was also when the first complete census in all plots was

236   conducted. To mark the plants, a team of 2-3 people slowly walked

237   through each subplot and located all *Heliconia acuminata* and marked

238   them with a wooden stake to which was attached an individually

239   numbered aluminum tag. The size of each plant was measured in two

240   ways: (1) by counting its number of vegetative shoots and (2) by

241   measuring the height of the plant from the ground to the top of its

242   highest leaf (rounded to the nearest cm). Three additional plots were

243   established in continuous forest sites in 1998 (CF 4-6); all plants in

244   these plots were tagged and measuring in the same way as in other

245   plots.

246   c. **Frequency of Data Collection:** Plots were censused annually at the

247 onset of the rainy season to coincide with seedling establishment (generally

248 late January to February). The exception to this was the three continuous

249 forest plots established in August 1998, which were censused in August 1999.

250 Regular visits were made to all 13 plots throughout the rainy season to

251 identify reproductive individuals and record the number of flowering shoots

252 (i.e., infloresences) that they had produced.

253 3. Research Methods

254 a. **Demographic Surveys:** During each census team members recorded

255 which plants died, the size (i.e., height and number of shoots) of all

256 surviving plants, and the size of all new seedlings, which were also marked

257 with a numbered tag. Survey team members also noted any new canopy

258 gaps created by fallen trees or limbs, estimated the proportion of any suplot

259 that was affected by a treefall (available at the HDP Github repository:

260 https://github.com/BrunaLab/HeliconiaSurveys), and recorded if plants

261 were under treefalls or damaged by fallen branches or palm fronds.

262 b. **Taxonomy and systematics:** *Heliconia* is the only genus in the family

263 Heliconiaceae. This family is distinguished from the others in the order

264 Zingiberales by having inverted flowers, a single staminode, and drupaceous

265 fruits (Kress 1990). It is estimated that there are 200-250 species of

266 *Heliconia*, almost all of which are native to the Neotropics. *Heliconia*

267 *acuminata* L. C. (Rich.) (Richard 1831) is one of the approximately 20

268 *Heliconia* species found in the Brazilian Amazon (Kress 1990). We

269 deposited voucher specimens of *H. acuminata* collected in areas adjacent to

270 demographic plots at the herbaria of the Instituto Nacional de Pesquisas da

271 Amazônia (Accession Numbers INPA 189569-189573) and the University of

272 California, Davis (Accession Numbers DAV 69391-69396).

4. **Project personnel:** In addition to the Originators, other key personnel include the Project Managers that were responsible for coordinating the annual censuses and other field activities, BDFFP Technicians (*"Mateiros"*) that assisted with data collection and provided logistical support in the field, and undergraduate and postgraduate field assistants hired to assist with the surveys.

   a. **Project Managers:** Paulo Rubim (2007-2012), Maria Beatriz Nogueira (2002), Maria Rosa Darrigo (2002-2003), Cris Follman Jurinitz (2003), Simone Benedet (2004).

   b. **BDFFP Technicians:** Osmaildo Ferreira da Silva, Francisco Marques, Alaercio Marajó dos Reis, João de Deus Fragata, Romeu Cardoso.

   c. **Undergraduate & Postgraduate Field Assistants:** Olavo Nardy (2000), Obed Garcia (2001), Sylvia Heredia (2001-2002), Maria Beatriz Nogueira (2002), Cris Follman Jurinitz (2003), David M. Lapola (2003), Denise Cruz (2003), Cristina Escate (2004), Bruno Turbiani (2005), Elisabete Marques da Costa (2006), Wesley Dáttilo da Cruz (2007), Jefferson José Valsko da Silva (2007).

CLASS III. DATA SET STATUS AND ACCESSIBILITY

A. Status

1. **Latest update:**

2. **Latest archive date:** [*date of archiving at Dryad to be added upon acceptance*]

3. **Metadata status:** Complete (last update: NA)

4. **Data verification:** An extensive review of the data was also conducted in preparation for archiving. We began by generating a list of potential anomalies that could indicate

errors (e.g. extremely large changes in size from one year to the next, plants marked as dead that had subsequent measurements), and then wrote code to search for these anomalies using the R statistical programming language (Team 2014). We also used the `pointblank` library (Iannone and Vargas 2022), which similarly identifies cases in a data set for review and validation. All records flagged were evaluated by E. M. Bruna by checking the values in the electronic records against the original data sheets. Corrections to the data set were also made using R scripts; the code documenting and implementing these changes is archived at Zenodo [*url to be added upon acceptance*]. Questions regarding the data set or code should be referred to E. M. Bruna, who will investigate and update the database or code as needed. Code for any post-publication updates is maintained at the HDP Github Repository.

B. Accessibility

1. **Storage location and medium:** Ecological Society of America Data Archives [url to be added] and the Dryad Digital Repository [url to be added].

2. **Contact person:** Emilio M. Bruna, Department of Wildlife Ecology and Conservation, Box 110430, Gainesville, FL 32611 USA. Phone: (352) 846-0634. Email: embruna@ufl.edu

3. **Copyright restrictions:** None

4. **Proprietary restrictions:** None.

   a. **Conditions of Reuse:** Any publication using data collected at the BDFFP must include a BDFFP Technical Series Number in the Acknowledgments. Authors can request this series number upon the acceptance of their article by contacting the BDFFP's Scientific Coordinator or E. M. Bruna.

   b. **Citation:** Authors of any publications or products using these data should

³²⁰ cite both this data paper and the Dryad data archive [*citation of Dryad*

³²¹ *archive to be added upon acceptance*]. We also request that they provide E.

³²² M. Bruna a copy of their article upon acceptance, which allows us to track

³²³ the data set's usage, inform users of any corrections or updates, report

³²⁴ articles using the data to the funding agencies that provided support, and

³²⁵ document the different ways in which the scientific community uses the data.

³²⁶ c. **Disclaimers:** While the data are provided in good faith and are accurrate

³²⁷ to the best of our knowledge, they are provided "as is". We do not assume

³²⁸ any legal liability or responsibility for their accuracy, completeness, or

³²⁹ utility. The responsibility for use and analysis of these data lies completely

³³⁰ with the user.

³³¹ 5. **Costs of acquiring data:** None.

³³² **CLASS IV. DATA STRUCTURAL DESCRIPTORS**

³³³ **A. Data set File 1:** Descriptors of demographic plots

³³⁴ 1. **Identity:** `HDP_plot_descriptors.csv`

³³⁵ 2. **Size:** 14 rows (including header), 404 Bytes

³³⁶ 3. **Format and storage mode:** ASCII text, comma delimited. No compression scheme

³³⁷ used.

³³⁸ 4. **Header information:** The first row of the file contains the variable names.

³³⁹ 5. **Alphanumeric attributes:** Mixed

³⁴⁰ 6. **Special Characters:** Missing values are represented with NA.

³⁴¹ 7. **Authentication Procedures**: checksum (MD5:2d3ec96006667abab1ecc14e72055850)

8. **Start & End Columns:** Start: `plot`, End: `yr_isolated`

9. **Variable Information:** Each row is one plot, with the columns providing plot-specific values for each variable.

B. Data set File 2: *Heliconia* Demographic Data

1. **Identity:** `HDP_data_1997-2009.csv`

2. **Size:** 66785 rows (including header), 3.61 MB

3. **Format and storage mode:** ASCII text, comma delimited. No compression scheme used.

4. **Header information:** The first row of the file contains the variable names.

5. **Alphanumeric attributes:** Mixed.

6. **Special Characters:** Missing values are represented with NA.

7. **Authentication Procedures**: Checksum (MD5:15bbb4869fe192649e93d3474d3145d1)

8. **Start & End Columns:** Start: `plot`, End: `tag_number`

9. **Data anomalies:** Plants that could not be found during a survey were recorded as 'missing' but maintained on the survey list to be searched for in subsequent years. The same is true of plants under branches or the crowns of fallen trees, which might not be found for several years when the crown's leaves dried and fell or the area under the crown could be safely searched. The codes used to denote such cases are defined in Table 2.

The stakes and numbered tags used to mark plants were sometimes displaced, broken, or buried under leaf litter as a result of tree falls or other disturbances. If

a plant's tag couldn't be found after an extensive search, it would be marked with a new tag. In some cases, it was straightforward to determine such a plant's original number when entering the survey data (e.g., when all plants in a low-density subplot were found except one, which in the prior year was similar in size as the plant found without a tag). In those cases, the plant's prior measurements were transferred to the new number and we logged the details of the change in tag number; the log is available at the HDP Github repository. In other cases, it was impossible to definitively determine a plant's original number (e.g., when two similarly sized plants in a subplots were both missing their tags). In these cases the original number was maintained in the database with the plant's status noted as 'missing' in subsequent surveys. The record for the new number indicates the plant with which it is associated is an established plant that was found without a tag (see Section IV, Table 2) and not a new seedling.

There were also cases in which established plants were found without tags in subplots where all previously tagged plants had already been located and measured, indicating previous survey teams had failed to find and mark them. These plants were marked, measured, and added to the database with a code indicating they were a established (i.e., post-seedling) but previously unmarked plant (See Table 2). Of the N = 947 plants in the data set, 11% were found without tags after the plot had been established. Almost half of these (49%) were in the three plots where *H. acuminata* density was highest (CF-1, FF-7, CF-3).

Due to logistical or financial constraints, no surveys were conducted in plot CF-6 in 2003, in plots CF-4, CF-5, and CF-6 in 2000, or plots FF-5,FF-6, and FF-7 in 2008-2009.

8. **Variable information:** Each row in the data set is a demographic plot, with columns of data describing that plot. Blanks do not denote missing information, but rather

389   nothing relevant to report.

CLASS V. SUPPLEMENTAL DESCRIPTORS

A. Data acquisition:

1. **Data forms:** Examples of the forms used to collect survey data are available on the HDP Github repository.

2. **Location of original data forms, electronic files, and archived copies:** Original data sheets are stored at the University of Florida. Scanned copies of the data sheets (in .pdf format) and the electronic copies of the data in (in .csv format) are stored on a desktop computer at the University of Florida that is backed up daily to two portable hard drives and two cloud storage services. The integrity of digital files is verified semi-annually.

3. **Data entry verification procedures:** Following each survey, the measurements of plant height and stem number were compared with those from the previous year to identify potential errors in either plant measurement or entry (e.g., a plant with 1 shoot in year t and 11 shoots in year t+1 is likely an error in data entry). Discrepancies were investigated by referring to the original data sheets and, on occasion, returning to the field to remeasure plants.

B. Quality assurance/quality control procedures: An extensive review of the data was conducted in preparation for archiving. We began by generating a list of potential anomalies that could indicate errors (e.g. extremely large changes in size from one year to the next, plants marked as dead that had subsequent measurements), and then wrote code to search for these anomalies using the R statistical programming language (Team 2014). We also used the `pointblank` library (Iannone and Vargas 2022), which similarly identifies cases in a data set for review and validation. All records flagged were evaluated by E. M. Bruna by checking

the values in the electronic records against the original data sheets. Corrections to the data set were also made using R scripts; the code documenting and implementing these changes is archived at Zenodo [*url to be added upon acceptance*]. Questions regarding the data set or code should be referred to E. M. Bruna, who will investigate and update the database or code as needed. Code for any post-publication updates is maintained at the HDP Github Repository.

C. Related materials: A diagram showing each demographic plots' location, orientation, and subdivision into subplots can be found in Appendix S1. Photographs, data summaries, updates, and other related materials can be found at the HDP Github Repository.

D. Computer programs and data-processing algorithms: The version of the R code used to prepare this data archive can be found at Zenodo [*url to be added*]. Any post-publication updates to the code or data can be found at the HDP Github Repository (https://github.com/BrunaLab/HeliconiaSurveys).

F. Publications:

1. **Publications including analyses of the data set.** An update list and downloadable *BibTeX* file can be found at the HDP Github repository.

   1. Bruna, E. M. and W. J. Kress. 2002. Habitat fragmentation and the demographic structure of an Amazonian understory herb (*Heliconia acuminata*). *Conservation Biology*, 16(5): 1256-1266.

   2. Bruna, E. M., O. Nardy, S. Y. Strauss, and S. P. Harrison. 2002. Experimental assessment of *Heliconia acuminata* growth in a fragmented Amazonian landscape. *Journal of Ecology*, 90(4): 639-649.

   3. Bruna, E. M. 2002. Effects of forest fragmentation on *Heliconia acuminata* seedling recruitment in the central Amazon. *Oecologia*, 132:235-243.

4. Bruna, E. M. 2003. Are plant populations in fragmented habitats recruitment limited? Tests with an Amazonian herb. *Ecology*, 84(4): 932-947.

5. Bruna, E. M. 2004. Biological impacts of deforestation and fragmentation. Pages 85-90 in *The Encyclopaedia of Forest Sciences.* J. Burley, J Evans, and J Youngquist, (eds.). Elsevier Press, London.

6. Bruna, E. M., and M. K. Oli. 2005. Demographic effects of habitat fragmentation on a tropical herb: Life-table response experiments. *Ecology* 86:1816-1824.

7. Bruna E. M. & W. J. Kress. 2005. Forest fragments and plant reproduction in Amazonian Brazil. pp. 141-146 in G. A. Krupnick & W. J. Kress (eds). *Plant conservation: a natural history approach.* University of Chicago Press, Chicago.

8. Morris, W. F., C. A. Pfister, S. Tuljapurkar, C. V. Haridas, C. Boggs, M. S. Boyce, E. M. Bruna, D. R. Church, T. Coulson, D. F. Doak,, S. Forsyth, J-M. Gaillard, C. C. Horvitz, S. Kalisz, B. E. Kendall, T. M. Knight, C. T. Lee, and E. S. Menges. 2008. Longevity can buffer plant and animal populations against changing climatic variability. *Ecology* 89(1): 19-25.

9. Fiske, I., E. M. Bruna, and B. M. Bolker. 2008. Effect of sample size on estimates of population growth rates calculated with matrix models. *PLoS ONE* 3(8): e3080.

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Variable	Definition	Codes	Storage
plot	Code used to identify a plot	FF1-FF7: plots in fragments CF1-CF6: plots in continuous forest	string
habitat	Habitat in which a plot is located	one: 1-ha fragment ten: 10-ha fragment forest: continuous forest	string
ranch	Ranch in which a plot is located	porto alegre esteio dimona	string
bdffp_no	The ID code assigned by the BDFFP to a reserve	1104, 1202, 1301, 1501, 2107, 2108, 2206, 3209, 3402, NA: For an explanation of the numbering scheme see Gascon and Bierregaard 2001. 'NA' indicates a plot is not inside the boundaries of a demarcated BDFFP reserve.	string
yr_isolated	For fragments, the year they were initially isolated	1980, 1983, 1984	integer

| Variable	Definition	Codes or Range of Values (Units, Precision)	Storage
plot	Plot in which plant is located	FF1-FF7, CF1-CF6	string
subplot	Subplot in which plant is located	A1-E10 in all plots except CF3, where F6-J10	string
plant_id	Unique ID no. assigned to plant	range = 1-8660 (units = number, precision = 1)	integer
year	Calendar year of survey	range = 1998-2009 (units = year, precision = 1)	integer
shts	No. of shoots when surveyed	range = 0-24 (units = shoots, precision = 1)	integer
ht	Plant height when surveyed	range = 0-226 (units = cm, precision = 1)	integer
infl	if flowering, the no. of inflorescences	range = 1-7 (units = shoots, precision = 1)	integer
recorded_sdlg	Plant was new seedling that year	TRUE, FALSE	logical
found_without_tag	Plant was established, post-seedling individual with no tag	TRUE, FALSE	logical
treefall_status	Plants under fallen trees trunks or crowns, branches, or leaf litter	branch: under fallen branches or tree limbs tree: under tree crown or multiple fallen trees litter: under accumulated leaf-litter	string
census_status	Plant status in a census	measured: alive, measured dead: died between current and prior census missing: not found during census	string
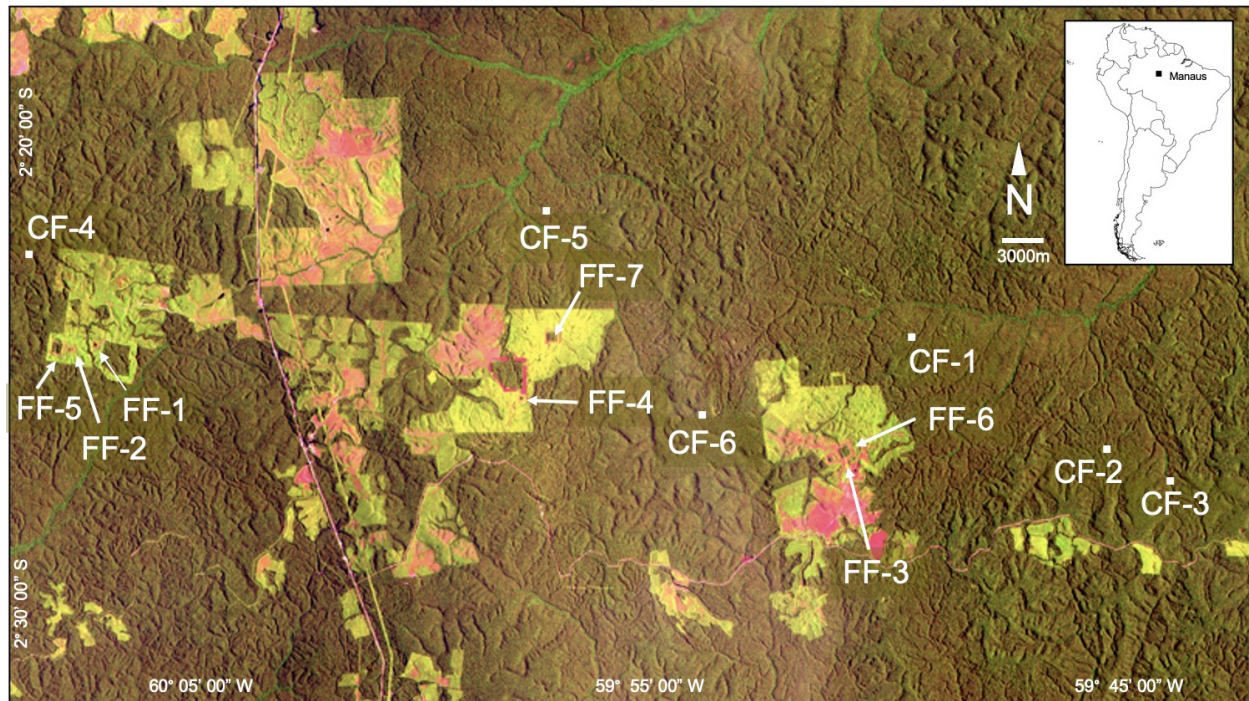
Figure 1. Satellite image of the Biological Dynamics of Forest Fragments Project (ca. 1995) showing the location of the *Heliconia* Demographic Plots. Plots are located in Continuous Forest (CF1-CF6) or Forest Fragments (FF1-FF7), both of which are dark green. Light green areas are regenerating forest, while red indicates pasture. The BDFFP is located 70 km north of Manaus, Brazil (inset map). For additional details on each plot see Table 1.