1   *Ecology*: Data Paper

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/------

18   Author Note

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22   The authors made the following contributions. Emilio M. Bruna: Methodology, Data

23   curation, Investigation, Funding acquisition, Conceptualization, Formal analysis,

24   Methodology, Project administration, Resources, Software, Supervision, Validation,

25   Visualization, Writing – original draft; Maria Uriarte: Methodology, Investigation, Funding

26   acquisition, Conceptualization, Formal analysis, Methodology, Project administration,

27   Resources, Software, Supervision, Validation, Visualization, Writing – review & editing;

28   Maria Rosa Darrigo: Methodology, Investigation, Project administration, Writing – review &

29   editing; Paulo Rubim: Methodology, Investigation, Project administration, Writing – review

30   & editing; Cristiane F. Jurinitz: Methodology, Investigation, Project administration, Writing

31   – review & editing; Eric R. Scott: Methodology, Data curation, Software, Validation,

32   Visualization, Writing – review & editing; Osmaildo Ferreira da Silva: Investigation, Project

33   administration; W. John Kress: Methodology, Investigation, Funding acquisition,

34   Conceptualization, Methodology, Resources, Writing – review & editing.

³⁵ **METADATA**

³⁶ **I. CLASS I. Data Set Descriptors**

³⁷ **A. Data set identity:** Demographic data from populations of the understory herb

³⁸ *Heliconia acuminata* (Heliconiaceae) in an experimentally fragmented tropical landscape

³⁹ (1997-2009).

⁴⁰ **B. Data set identification code:**

⁴¹ 1. Dataset File 1: `HDP_plots.csv`

⁴² 2. Dataset File 2: `HDP_1997_2009.csv`

⁴³ **C. Data set description:**

⁴⁴ 1. **Originators:** Emilio M. Bruna, Department of Wildlife Ecology and Conservation,

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⁴⁷ USA.

⁴⁸ 2. **Abstract:** Habitat fragmentation is thought to be a leading cause of extinction, but

⁴⁹ the demography of species in fragmented landscapes remains poorly understood. This

⁵⁰ is particularly true in tropical ecosystems, where studies monitoring populations of

⁵¹ species in both fragments and areas of continuous habitat across all life-history stages

⁵² are virtually nonexistent. Here we report 12 years (1997-2009) of annual censuses of 13

⁵³ populations of the Amazonian understory herb *Heliconia acuminata* (LC Rich.). These

⁵⁴ surveys were conducted in plots established in the experimentally fragmented

⁵⁵ landscape of the Biological Dynamics of Forest Fragments Project, located north of

⁵⁶ Manaus, Brazil. The plots, each 50×100m, are located in forest fragments of different

⁵⁷ sizes (N = 4 plots in 1-ha fragments and N = 3 plots in 10-ha fragments) as well as

⁵⁸ continuous forest (N = 6 plots). The population in each plot was censused annually, at

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

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

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

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

63   resulting dataset comprises >67000 plant×year records of 8586 plants, including 3464

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

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

66   germination influence population dynamics to tests of statistical methods for analyzing

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

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

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

70 dynamics, vital rates.

CLASS II. RESEARCH ORIGIN DESCRIPTORS

A. Overall project description:

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

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

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

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

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

78   2017, Fletcher et al. 2018) decades after it was first identified as a threat to the

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

80   research has documented myriad biotic changes associated with fragmentation,

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

82   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

109 2006) with which to (1) compare the demography and population dynamics of *H.*

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

111 hypothesis that reductions in seedling establishment in forest fragments would

112 lead to population declines.

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

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

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

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

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

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

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

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

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

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

123 flowering plants and the number of inflorescences each produced. The resulting dataset

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

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

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

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

128 analyzing reproductive rates.

141   **B. Subproject description**

142   1. **Site description**

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

144   b. **Geography:** The data were collected at the Biological Dynamics of Forest

145   Fragments Project (BDFFP, 2°30'S, 60°W), a 1000-km mosaic of lowland

146   forest, forest fragments, secondary forests, and pastures located

147   approximately 70 km north of Manaus, Amazonas, Brazil (Fig. 1).

148   c. **Habitat:** The BDFFP is dominated by tropical evergreen lowland forest

149   (i.e., 'tropical moist forest', *sensu* Holdridge (1967). The forest canopy at

150   the sites is ~35–40 m tall, with emergent trees of up to ~45 m

151   (Rankin-de-Mérona et al. 1992). The tree community at the BDFFP is

152   highly diverse: ~1300 species total (Laurance 2001), with as many as 280

153   tree species ha^{-1} (Oliveira and Mori 1999). The understory is dominated by

154   stemless palms (Scariot 1999). All HDP plots are located in *terra-firme* (i.e.,

155   non-flooded) forest and none are bisected by streams.

156   d. **Geology:** Soils in the sites are nutrient-poor xanthic ferralsols, known as

157   yellow latosols in the Brazilian soil classification system. Despite their high

158   clay content they have poor water-retention capacity (Fearnside and

159   Leal-Filho 2001). The often rugged topography at the BDFFP ranges in

160   elevation from 50-150 m elevation (Gascon and Bierregaard 2001).

161 e. **Watersheds:** The BDFFP landscape includes catchments of the Urubu,

162   Cuieiras, and Preto da Eva rivers (Nessimian et al. 2008).

163 f. **Site history:** A complete history of the BDFFP can be found in Gascon

164   and Bierregaard (2001) and Bierregaard et al. (2002). Briefly, the BDFFP

165   reserves were established on three cattle ranches. Fragments were isolated

166   between 1980-1984 by felling the trees surrounding the patch of forest to be

167   isolated (Lovejoy et al. 1986). Fragment reserves were fenced to prevent the

168   incursion of cattle from the surrounding pastures. To ensure fragments

169   remain isolated, a 100m strip around each fragment is regularly cleared of

170   the secondary growth (Gascon and Bierregaard 2001). The structure and

171   species composition of the secondary growth that surrounds a fragment,

172   which is strongly dependent on whether fire was used to clear land prior to

173   planting pasture grasses (Mesquita et al. 2001), can have large effects on

174   the species composition, ecological processes, and abiotic conditions in

175   fragments (reviewed in Laurance et al. 2002, 2011). The BDFFP is

176   currently administered collaboratively by the Smithsonian Tropical Research

177   Institute and Brazil's Instituto Nacional de Pesquisas da Amazônia (INPA).

178 g. **Climate:** Mean annual temperature at the site is 26°C (range 19-39°C).

179   Annual rainfall ranges from 1900-2300 mm (Scott et al. 2022), with a

180   pronounced dry season from June-December in which there is <100 mm

181   rain per month.

182 2. **Sampling Design & Research Methods**

183 a. **Focal species:** *Heliconia acuminata* (Heliconiaceae) is a perennial,

self-incompatible monocot native to Amazonia (Kress 1990) and widely

distributed throughout the Amazon basin (Kress 1990). Although many

species of *Heliconia* grow in large aggregations on roadsides, gaps, and in

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

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

abundant understory herb throughout much of the BDFFP (Ribeiro et al.

2010); the other two *Heliconia* species found in the BDFFP reserves are

either very rare (*H. latispatha*) and restricted saturated soils adjacent to

streams (*H. tarumaensis*).

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

erect vegetative shoots with broad leaves. Reproductive plants have

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

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

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

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

beetles, whose larvae and adults scrape the surface of unrolled

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

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

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

damage to bracts, flowers, and developing ovaries.

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 dataset 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

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

especially in fragments. These results are consistent with the

generalization that few plant species in lowland tropical forests have

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

b. **Taxonomy, systematics, and voucher specimens:** *Heliconia* is the only genus in the family Heliconiaceae. This family is distinguished from the others in the order Zingiberales by having inverted flowers, a single staminode, and drupaceous fruits (Kress 1990). It is estimated that there are 200-250 species of *Heliconia*, almost all of which are native to the Neotropics. *Heliconia acuminata* L. C. (Rich.) (Richard 1831) is one of the approximately 20 *Heliconia* species found in the Brazilian Amazon (Kress 1990). We deposited voucher specimens of *H. acuminata* collected in areas adjacent to demographic plots at the herbaria of the Instituto Nacional de Pesquisas da Amazônia (Accession Numbers INPA 189569-189573) and the University of California, Davis (Accession Numbers DAV 69391-69396).

c. **Permanent Plots:** Surveys of *Heliconia acuminata* demography were carried out in 13 permanent demographic plots distributed across the BDFFP landscape (Bruna and Kress 2002). Six plots are in continuous forest, four are in 1-ha fragments, and three are in 10-ha fragments (Fig. 1). Each demographic plot is 50×100m and is subdivided into 50 contiguous subplots of 10×10m to facilitate the surveys. Plots in 1-ha fragments were established in a randomly selected half of the fragment, plots in 10-ha fragments are located in the center of the fragment, and plots in continuous forest are located 500-4000 m from any borders with cattle pastures or secondary forest (Fig. 2). The plots furthest apart are from each other are separated by ~70 km.

Plots in 1-ha fragments, 10-ha fragments, and three of the continuous forest sites were demarcated in January-April 1997. The remaining three plots in continuous forest were demarcated in January 1998, which was also when the first complete census in all plots was

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

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

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

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

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

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

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

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

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

271   plots.

272   d. **Frequency of Data Collection** Plots were censused annually at the onset

273   of the rainy season to coincide with seedling establishment (generally late

274   January to February). The exception to this was the three continuous forest

275   plots established in August 1998, which were censused in August 1999.

276   During each census team members recorded which plants died, the size (i.e.,

277   height and number of shoots) of all surviving plants, and the size of all new

278   seedlings, which were also marked with a numbered tag. Survey team

279   members also noted any new canopy gaps created by fallen trees or limbs,

280   estimated the proportion of any suplot that was affected by a treefall

281   (available at the HDP Github repository:

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

283   were damaged by fallen branches or palm fronds (reported here).

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

285   identify reproductive individuals and record the number of flowering

286   shoots (i.e., infloresences) that they had produced.

287   3. **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 & quality control 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.

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

4. **Copyright restrictions:** None

5. **Proprietary Restrictions:**

   a. **Proprietary restrictions:** None.

   b. **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.

   c. **Citation:** Authors of any publications or products using these data should cite both this data paper and the Dryad data archive [*citation of Dryad archive to be added upon acceptance*]. We also request that they provide E. M. Bruna a copy of their article upon acceptance, which allows us to track the dataset's usage, inform users of any corrections or updates, report articles using the data to the funding agencies that provided support, and document the different ways in which the scientific community uses the data.

   d. **Disclaimers:** While the data are provided in good faith and are accurrate to the best of our knowledge, they are provided "as is". We do not assume any legal liability or responsibility for their accuracy, completeness, or utility. The responsibility for use and analysis of these data lies completely with the user.

CLASS IV. DATA STRUCTURAL DESCRIPTORS

360 **A. Dataset File 1:** Descriptors of demographic plots

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

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

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

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

366   5. **Alphanumeric attributes:** Mixed

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

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

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

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

372   **[INSERT TABLE 1 HERE]**

373 **B. Dataset File 2:** *Heliconia* Demographic Data

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

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

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

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

379   5. **Alphanumeric attributes:** Mixed.

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

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

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

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

389   The stakes and numbered tags used to mark plants were sometimes displaced,
390   broken, or buried under leaf litter as a result of tree falls or other disturbances. If
391   a plant's tag couldn't be found after an extensive search, it would be marked
392   with a new tag. In some cases, it was straightforward to determine such a plant's
393   original number when entering the survey data (e.g., when all plants in a
394   low-density subplot were found except one, which in the prior year was similar in
395   size as the plant found without a tag). In those cases, the plant's prior
396   measurements were transferred to the new number and we logged the details of
397   the change in tag number; the log is available at the HDP Github repository. In
398   other cases, it was impossible to definitively determine a plant's original number
399   (e.g., when two similarly sized plants in a subplots were both missing their tags).
400   In these cases the original number was maintained in the database with the
401   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 dataset, 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
   nothing relevant to report.

[**INSERT TABLE 2 HERE**]

CLASS V. SUPPLEMENTAL DESCRIPTORS

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

B. **Publications and results:** The following articles have included analyses of part or all of
the dataset. An update list can be found at the HDP Github repository

(https://github.com/BrunaLab/HeliconiaSurveys).

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.

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C. **Other relevant publications and datasets:** The following data archives and articles include information (e.g., seeds per fruit, seed germination rates, seedling survival rates, plant growth rates following damage) that can be used in concert with the census data to conduct demographic modeling and other analyses. An updated list can be found in the HDP's Github repository (https://github.com/BrunaLab/HeliconiaSurveys).

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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
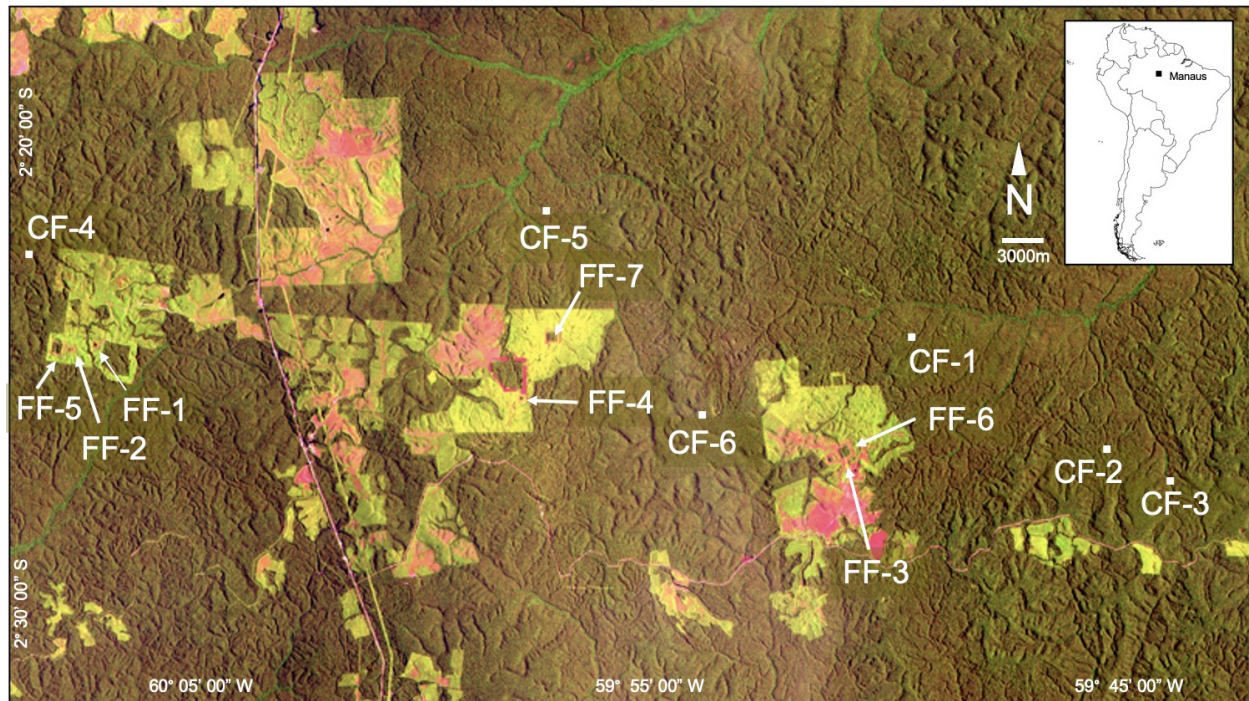
Figure 1. Satellite image of the Biological Dynamics of Forest Fragments Project (ca. 1995) showing the location of the *Heliconia* Demographic Plots. Plots are located in Continuous Forest (CF1-CF6) or Forest Fragments (FF1-FF7), both of which are dark green. Light green areas are regenerating forest, 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.