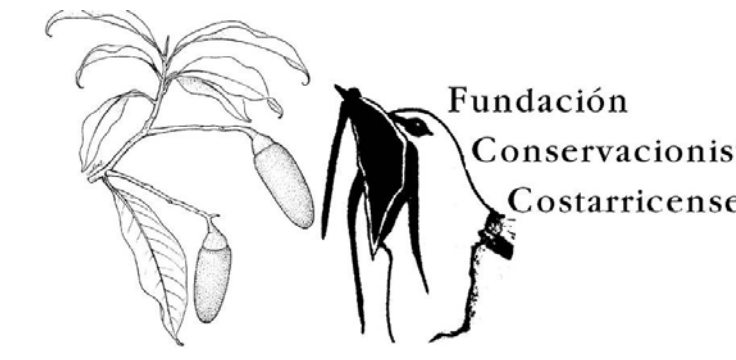


Bellbirds, Wild Avocados, and Habitat Protection: A Three Part Puzzle in Preventing Extinction



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Introduction

Conservation Biologists warn that humans are causing a sixth major mass extinction (Wilson, 2002). The most effective way to slow down extinction rates is to protect habitat. In order to identify critical habitat for the threatened Three-wattled Bellbird, we are studying the fruiting of wild avocado trees which provide the most important food source for this species.



Fruits and seeds of one of the more than seventy species of wild avocado trees that occur in the Monteverde Region of Costa Rica.



The Three-wattled Bellbird (a wild avocado feeder) is a threatened species that occurs only in Nicaragua, Costa Rica, and Panama.

Research Questions:

- (1) What is the year-to-year variation in habitat use by Bellbirds in their post-breeding range in the Monteverde Region of Costa Rica?
- (2) Does year-to-year variation in the fruiting of wild avocado species explain variation in habitat use by Bellbirds?
- (3) Are certain wild avocado species particularly important as food for bellbirds, and can they be used to target habitat for protection and tree species to plant in reforestation efforts?

Methods

- In early 2005, 182 trees representing 16 fruiting tree species were permanently tagged in twenty-four 20m x 50m plots distributed in three different habitat zones in Monteverde.
- All trees were sampled monthly from May of 2005 to September of 2010.
- For each monthly sample, the number of flowers, fruit and Bellbirds in each tree was recorded.
- Data were analyzed graphically and by Poisson repeated measures multiple regression analysis using "R" Software.



Sampling a tagged tree for flowers, fruit and birds.

Results

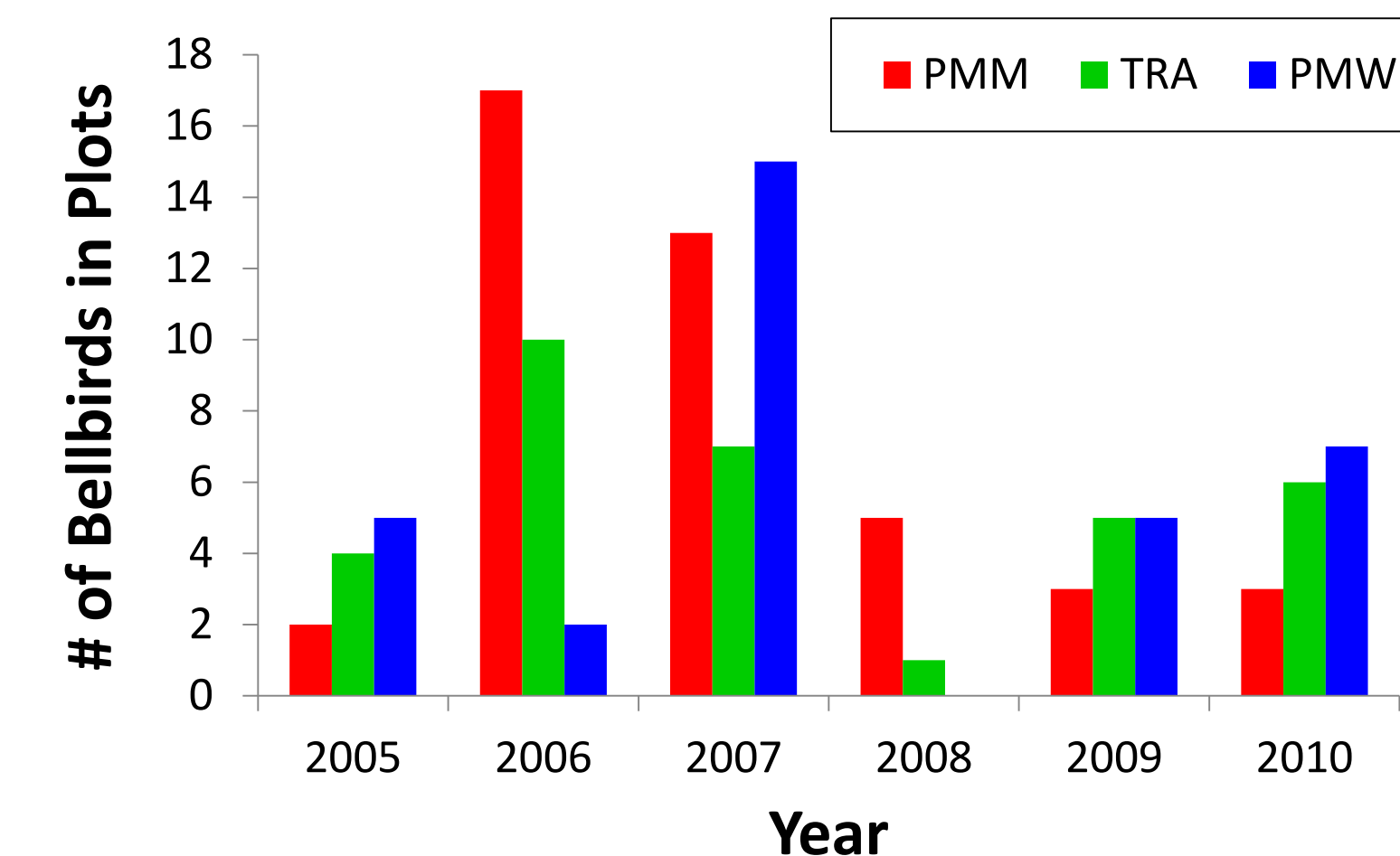


Figure 1. Year-to-year variation in Bellbird abundance in the PMM, TRA and PMW zones in the Monteverde Region. These habitat zones represent forest types that differ in terms of precipitation and plant species composition. $p=0.014$, $\chi^2=22.15$ (chi-square analysis).

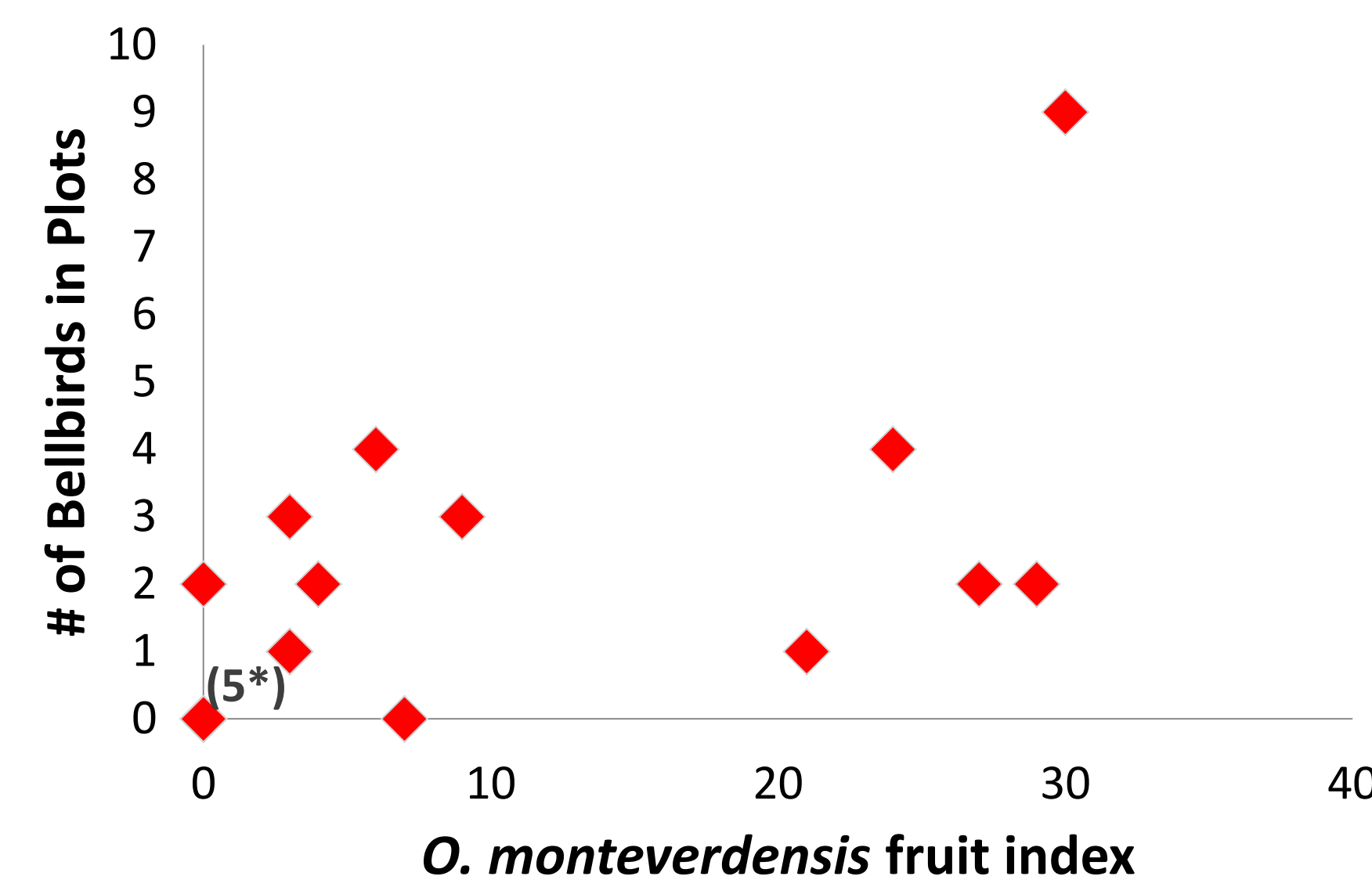


Figure 2. The relationship between Bellbird abundance and fruit abundance of *Ocoteca monteverdensis* in the PMW zone. $p=0.0114$ (Poisson repeated msrs. reg.). *Note that in 5 of 6 cases when there were no Bellbirds, there were no ripe *O. monteverdensis* fruit.

- Bellbirds show considerable year-to-year variation in which habitat zones they use.

- The abundance of Bellbirds is associated with the abundance of *Ocoteca monteverdensis* fruits. Additional results suggest several other wild avocado species are important.

Discussion

- During the post-breeding season of June through August, Bellbirds use a variety of locations in all three zones in the Monteverde Region. Because of this year-to-year variation in habitat use, habitat within each zone should be protected.
- Because of the importance of *Ocoteca monteverdensis* (as well as several other wild avocado species), habitat protection and restoration efforts should target these species.
- Protecting habitat for the Bellbird in the Monteverde Region and other parts of Costa Rica used during other phases of the Bellbird breeding cycle is an important piece of the puzzle in preventing extinction of the Bellbird and countless other species that rely on these habitats.

References

Wilson, E.O. 2002. *The Future of Life*, Vintage Books, New York, NY.

Additional Information about the Study

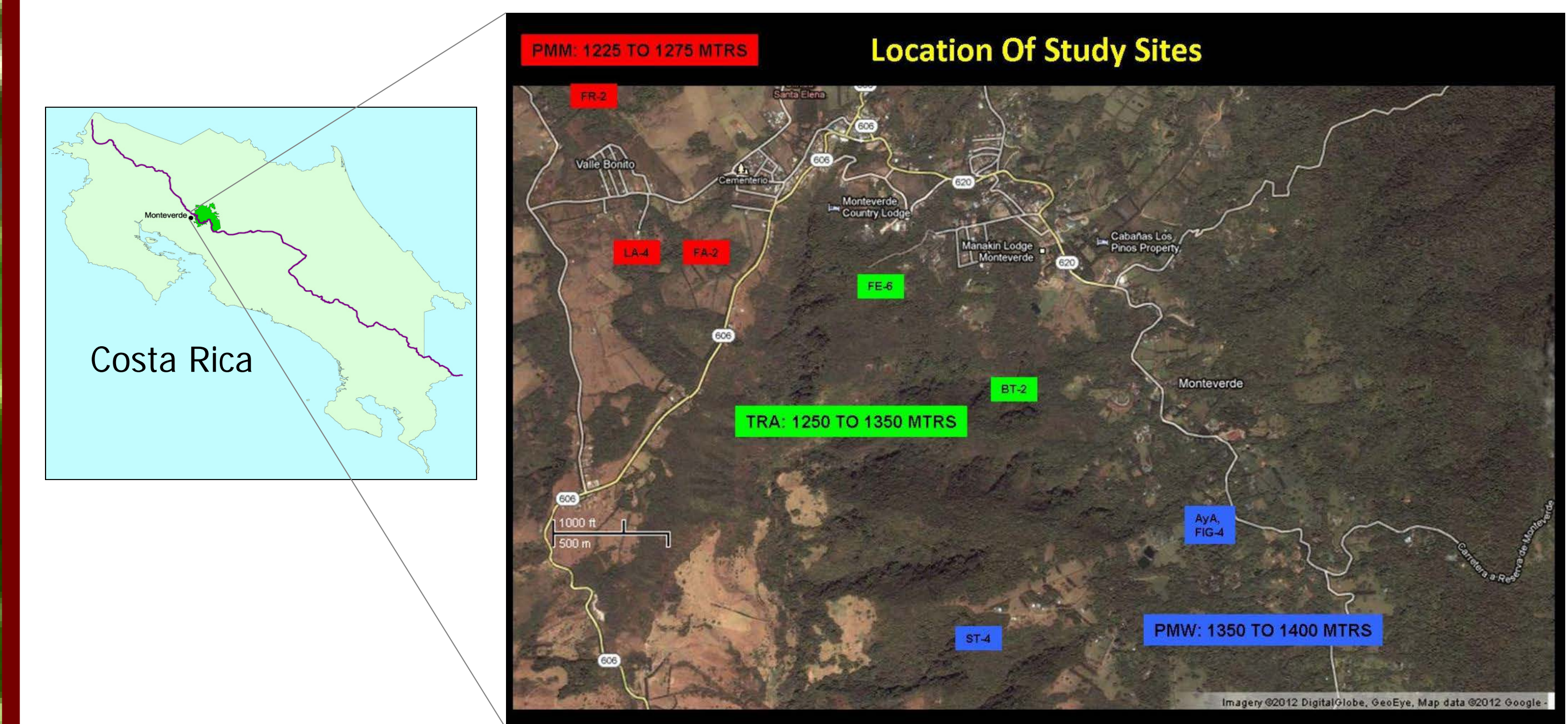


Figure 3. Map showing location of the study in the Monteverde Region of Costa Rica. Red sites are in premontane moist forest (PMM), green sites in transition forest (TRA) and blue in premontane wet forest (PMW) based on the Holdridge Life Zone classification. There are a total of eight 20m x 50m plots in each habitat zone.

Bellbird Census through 2010

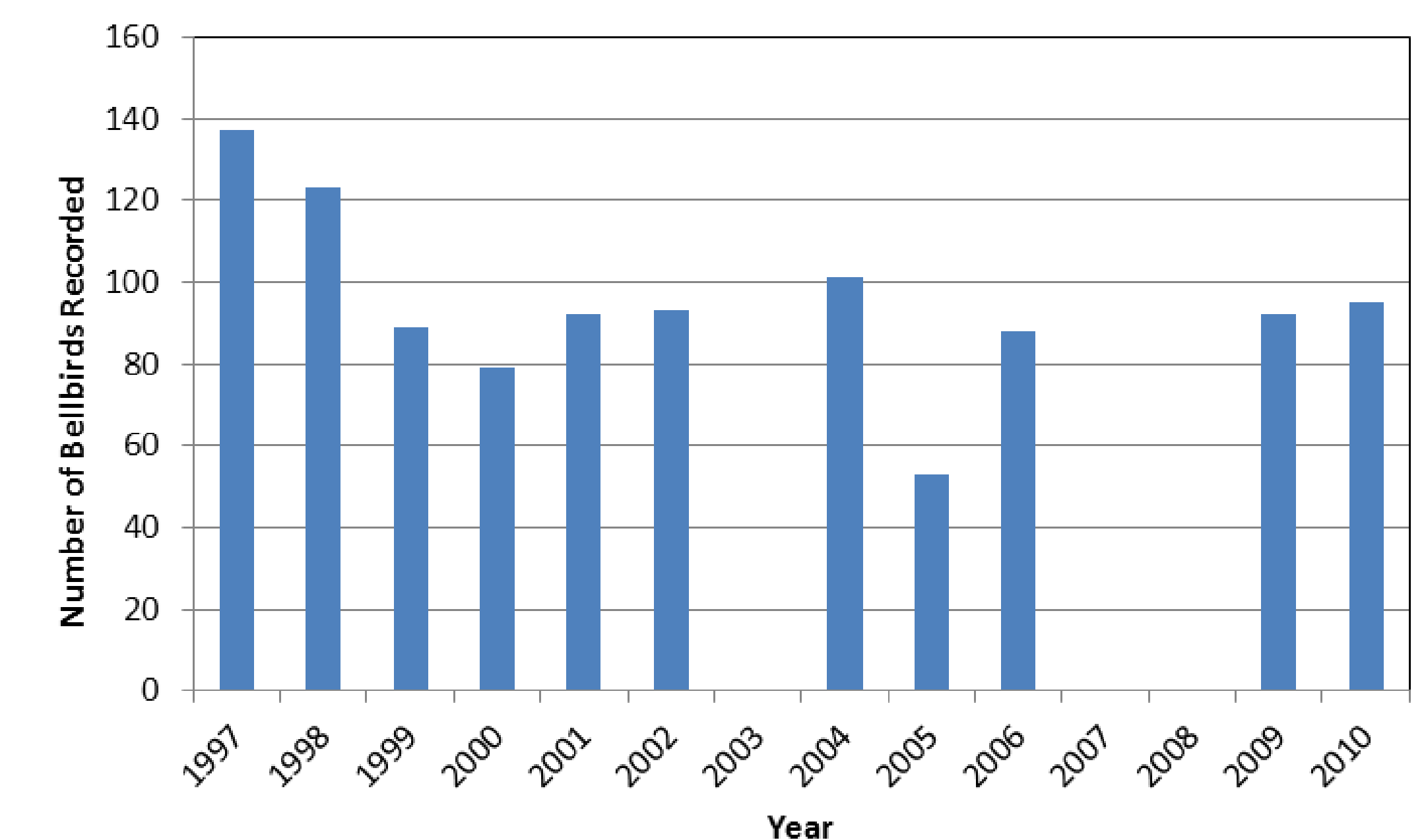


Figure 4. Bellbird counts from the annual census conducted by the Costa Rican Conservation Foundation. In 2003, 2007 and 2008 no census was conducted. After an apparent decline in the late 1990s, the population seems to have stabilized, though clearly more data are needed. (The actual population size is several times that of the census count.)



Figure 5. Interaction of an adult male (white head) and juvenile male. The adult male gives a loud "bonk" into the ear of the juvenile to reclaim his perch. The "bonk" of the bellbird is reported to be the loudest bird call in the world.



Figure 6. A picture of one of our tagged trees. This individual is a member of a new species, *Myrcianthes* "black fruit." It has yet to be described and given a formal species name by botanists.

Photos courtesy of Debra Hamilton