

# Support for Native, Solitary Pollinator Conservation among the Public versus Hobby Beekeepers

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# Pollinator Declines

- Severe declines of honey bees (*Apis mellifera*)
- Rusty Patched Bumble Bee (*Bombus affinis*): first bee species added to USFWS endangered species list Spring 2017
- Dramatic range-wide population declines among other bees (Cameron et al., 2011; Jacobson et al., 2018)
- Overall 75% decrease in insect biomass over 3 decades (Hallmann, et al., 2017, Lister & Garcia, 2018)



# Sparse Valuation of Insects

- Insects not present in valuation of threatened and endangered species reflected by meta analyses (Richardson and Loomis, 2008)
- Diffendorfer, Loomis, et al. (2014): one-time WTP of \$4.8-6.6 billion to support Monarch butterfly (*Danaus plexippus*) conservation
- Mwebeze et al. (2018): WTP of £43 household/year for a bee protection policy ‘to maintain bee populations at the current level’
- Khachatryan, et al. (2017) and Wollaeger, et al. (2015): positive WTP for a ‘pollinator-friendly’ and ‘bee-friendly’ attribute, respectively, for potential purchases of houseplants

# Public Awareness and Efforts

- Increase in public awareness and support for pollinator conservation (Wilson et al. 2017)
- EPA-USDA's "National Strategy to Promote the Health of Honey Bees and Other Pollinators" (2015) to decrease honey bee mortality, increase monarch butterflies, and increase pollinator habitat acreage

# A Honey Bee Dilemma

- Helpful: Honey bees are a flagship, well-known and able to facilitate broader knowledge and financial support for conservation of other species

***Conserving honey bees does not help wildlife***

High densities of managed honey bees can harm populations of wild pollinators



- Harmful: Viewed as more similar to livestock among ecologists; compete with/crowd out native pollinators

Can honey bees still be good for native pollinator conservation?  
Are native, less iconic pollinators also valuable?

# Goals

- Determine the Willingness to Pay (WTP) among the general public to support native, solitary pollinator species distinct from honey bees.
- Measure if beekeepers have different perceptions and WTP for native, solitary pollinators to the general public.
- Utilizes an in-person survey of honey consumers versus beekeepers in Louisiana for WTP of bee hotels



# Public Survey

- Collected Summer 2018 at area parks and events throughout Baton Rouge
- 1<sup>st</sup> half focused on preferences and purchasing habits of honey, followed by demographics
- Received a half-pound bottle of honey
- Had an opportunity to return honey for cash.



# Beekeeper Survey

- Collected in-person Fall 2018 at USDA-ARS Field Day in Baton Rouge, LA and LBA Convention in Slidell, LA
- 1<sup>st</sup> half focused on their practices and their concerns and methods of maintaining honey bee health.
- Received a test kit for *Varroa* mite (*Varroa destructor*), and entered into a drawing for door prizes.



# Valuation

Second half was common across samples, querying for knowledge of honey bees, honey bee identification, and knowledge and opinions towards other pollinators. Followed by elicitation.

“Fast Facts:

- While honey bees are important to US agriculture, pollinating \$15 billion in US crops each year, they are not native to North America.
- Native pollinators to North America are also important contributors to crop pollination.
- USDA research has shown a significant decline for both native pollinators and honey bees throughout the US.”

# Elicitation

- Willingness to purchase a bee hotel
- Private good mechanism to elicit WTP for public good provision (insect biodiversity)
- Single dichotomous choice
- Price: \$10, \$20, or \$30
- Does not aid honey bees
- Modeled using standard logit

“About 30% of native bee pollinators in North America are solitary bees, such as carpenter bees and mason bees, which need a different kind of home versus honey bees. One way to support solitary bees is to install a permanent nesting habitat, known as a 'bee hotel/bee house.' They are about the same size as a birdhouse and can be installed in a yard or porch such as the one pictured below.



Would you be willing to buy and install one such bee hotel for \$X?”

# Additional Details

- Asked about consequentiality
- To correct for Hypothetical Bias, implemented a brief ex-ante Cheap Talk and ex-post Certainty Follow-up
- Screened out inattentive respondents via attention-check questions
- Must maintain brevity (~10 minutes) and approval from LBA/USDA

# Samples

- Beekeepers n=138
- General Public n=265
- Beekeepers and the general public are different
- Beekeepers sample is expected
- Mismatch of general public to Baton Rouge

	Beekeepers Sample	General Public Sample	Baton Rouge Pop <sup>1</sup>	State Pop <sup>1</sup>
<b>N</b>	138	265		
<b>Age</b>				
18 - 34	8.0	54.5	43.5	32.0
35 - 64	63.0	39.6	40.0	50.0
65 or older	29.0	6.0	16.5	18.0
<b>Gender</b>				
Female	37.0	62.7	52.5	51.1
Male	63.0	37.3	47.7	48.9
<b>Education</b>				
High School or less	16.7	10.1	38.1	50.2
Some College	30.4	29.1	34.9	28.9
4-year or more	52.9	60.8	27.0	20.9
<b>Race</b>				
White	94.2	57.1	38.6	62.6
Black	2.20	29.5	54.8	32.2
Asian	0.0	6.3	3.6	1.7
Race-Other	3.6	7.1	2.9	3.5
<b>Beekeeping</b>				
<3 years exp.	59.4	0.0		
≥3 years exp.	40.6	0.0		
In Beekeeping Club	71.0	0.0		

# Knowledge and Attitudes

	Beekeeper Sample	General Public Sample
<b>Knowledge</b> (1-Definitely Agree, 5-Definitely Disagree)		
<i>Native</i> : Honey bees are a native species to North America. (+)	4.02	2.62*
<i>Survival</i> : The rate of honey bee colony survival from year to year has <i>increased</i> in the past 10 years. (/)	3.47	3.45
<i>Imports</i> : The US produces a large majority of its own honey rather than from imports. (/)	2.95	2.55*
<i>Disease</i> : Honey bees can transmit disease and parasites to native pollinators. (-)	2.70	3.22*
<b>Attitude</b> (1-Definitely Agree, 5-Definitely Disagree)		
<i>Wildlife</i> : Honey bees are more similar to wildlife than to livestock. (-)	2.28	2.35
<i>US Food</i> : Honey bees are important to US food production. (/)	1.17	1.42*
<i>Environment</i> : Honey bees are important to the environment. (-)	1.14	1.25
<i>Other Pollinators</i> : Excluding honey bees, I'm <i>not</i> concerned about other pollinators. (+)	4.18	4.03
<i>Honey Production</i> : Honey bees are more important to me than native pollinators because of honey production. (+)	2.67	2.98*
<i>Biodiversity</i> : Insect biodiversity is important. (-)	1.47	1.95*

# Turnbull Results

	<b>Beekeepers</b>	<b>General Public</b>
	<b>%Yes, %Certain Yes</b>	<b>%Yes, %Certain Yes</b>
\$10	72.0, 58.0	67.1, 41.2
\$20	66.7, 55.6	51.7, 27.0
\$30	64.7, 44.1	42.9, 24.2
Turnbull lower	20.34, 15.77	16.16, 9.23
bound (Variance)	(1.49, 1.67)	(0.81, 0.71)

# Model Results

- Demographics generally insignificant
- Expected intercept and price
- Native, Disease, Other Pollinators, and Biodiversity demonstrate some importance

	1. Base	2. Extended	3. Certainty Calibrated Base	4. Certainty Calibrated Extended
Intercept	0.689	0.514	-1.626*	-2.238*
Price	-0.040***	-0.041***	-0.032**	-0.038**
Beekeeper <3 years exp.	0.410	1.473	0.84***	2.259
Beekeeper ≥3 years exp.	-0.227	1.059	0.693*	2.301
Correct Honey Bee	0.134	0.113	0.427	0.374
Native	0.121	0.285**	0.014	0.235*
Disease	-0.022	-0.043	0.205*	0.449***
Wildlife	0.018	0.104	0.084	0.259*
Environment	-0.131	-0.338	-0.104	-0.58*
Other Pollinators	0.167	0.219	0.249**	0.311*
Honey Production	0.189*	0.214	0.073	-0.113
Biodiversity	-0.597***	-0.78***	-0.484***	-0.602***
BK*Correct Honey Bee		-0.051		0.185
BK*Native		-0.333		-0.389*
BK*Disease		-0.114		-0.551**
BK*Wildlife		-0.182		-0.321
BK*Environment		0.412		0.86*
BK*Other Pollinators		-0.135		-0.159
BK*Honey Production		-0.077		0.365*
BK*Biodiversity		0.573**		0.404
Number of obs.	403	403	403	403
Log-likelihood	-231.76	-225.03	-228.13	-222.80
AIC	507.692	500.428	511.526	498.059

# Willingness to Pay

	Raw WTP (Based on Model 2)	Certainty Calibrated WTP (Based on Model 4)
<b>Beekeepers with 1-3 years experience</b>	\$42.71 (72.33 13.09)	\$23.17 (45.53 2.81)
<b>Beekeepers with ≥3 years experience</b>	\$32.62 (58.27 6.97)	\$24.28 (45.07 3.49)
<b>General Public</b>	\$25.77 (48.85 2.69)	-\$4.63 (0.06 -9.32)

- After correcting for HB, the general public sample places virtually no value on solitary bee conservation.
- Beekeepers, regardless of experience and HB, maintain relatively high WTP for solitary bee conservation.

# Discussion and Implications

- The general public sample places little value on solitary bee conservation via bee hotel installation.
- Beekeepers are generally willing to pay more for bee hotels thus are more likely to support native pollinators than the general public.
  - Beekeeping experience has little impact.
- Promoting the plight of honey bees and beekeeping appears to be a mechanism for promoting native pollinator conservation.

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