

# What's the Buzz About Bees?

Bob Allen

Research Associate, Rancho Santa Ana Botanic Garden

Research Associate in Entomology, Natural History Museum of L.A. County

## Outline

- What are bees?
- Bee-evolution
- Bee-odiversity
- Bee-ology
- Bee-threats
- Bee-action
- Bee-happy!

## What are bees?

- Arthropods
  - Exoskeleton
  - Major body regions
  - Paired jointed appendages
  - Internal features.

## What are bees?

- Insects
  - 3 main body regions
    - Head (nerve, feeding)
    - Thorax (locomotion)
    - Abdomen (digest, repro)
  - 6 legs (thorax)
  - Wings: 0, 2, 4 (thorax).

## Bee-evolution

- Evolved from wasps
- Share a recent common ancestor with Sphecidae
  - Mud daubers
  - Mud wasps
  - Sand wasps.

## Bee-odiversity

- World 20,000
- North America 4,000
- California 1,600
- So Calif ? 1,000
- OC ? 600

## Western Honey Bee

- Western Honey bee, *Apis mellifera*, on Telegraph Weed, *Heterotheca grandiflora* (p. 123), and on dove weed, *Croton setiger* (p. 234) in Riley Wilderness Park
- Native to Europe & Africa, the Western Honey Bee, *Apis mellifera*, is now worldwide
- Several local forms of *Apis mellifera*, especially in Europe
  - Northern Europe, *Apis mellifera mellifera*
  - Southern Europe, *Apis mellifera ligustica*
  - South Africa, *Apis mellifera scutellata*

## Bee-ology

- Holometabolous
- Complete metamorphosis
- Life cycle models made by Insect Lore, US Toy, Safari Ltd.

## Where do they nest?

- Nearly all bee species are solitary
  - ~70% in the ground
  - ~30% under bark, in holes & cracks
  - Few make their own holes: carpenter
- Very few species are social
  - Small nests: bumble bees
  - Only 1 species nests in little white boxes! *Apis mellifera*
- Leafcutter bee, *Osmia* spp., make linear nests in hollow stems
- Leafcutter bees cut circular holes in soft-leaved plants
- Leafcutter bee, *Megachile* spp., make branched nests in wood tunnels made by beetles
- Western digger bee, *Anthophora occidentalis*, makes nests in soil, makes a mud chimney
- Longhorn bees, *Melissodes* spp., makes nests in soil, unadorned opening
- Life cycle: pollen gathering, pollen ball, egg, larva, pre-pupa, pupa, adult

## Bee-threats

- Some decline in diversity & abundance of native bees. Causes?
  - pesticide use, habitat destruction and fragmentation, global climate change, reduction of host plants, invasive species...

## Bee-threats

- Colony Collapse Disorder (CCD)
  - Workers can lose their way home
  - Workers & drones leave the colony
  - Young and the queen die
  - Colony collapses.

## Bee-threats

- Closeup of a hive killed by CCD. Note that brood is present, but all adult bees have disappeared.

## Bee-threats

- CCD only affects western honey bee, *Apis mellifera*. Cause(s) still unknown
  - Mites? Mutation? Pesticides?
  - Western Honey Bee with attached Varroa Mites (*Varroa destructor*)
  - [http://entnemdept.ufl.edu/creatures/misc/bees/varroa\\_mite.htm](http://entnemdept.ufl.edu/creatures/misc/bees/varroa_mite.htm)

## Poisoning

- Imidacloprid (IMD)
  - Relatively new, widely used
  - Neonicotinoid “neo-nic”
- Annual die-off rate WHB 30%
- Even trace amounts of IMD make WHB lose their desire to feed
- Quickly leads to colony collapse.
- “We found that worker foraging performance, particularly pollen collecting efficiency, was significantly reduced with observed knock-on effects for forager recruitment, worker losses and overall worker productivity. Moreover, we provide evidence that combinatorial exposure to pesticides increases the propensity of colonies to fail.”
- “A honey bee, *Apis mellifera*, is headed toward an almond blossom. Massive losses of these managed honey bees are occurring every year, and pesticide poisoning is part of the problem.”
- “Soil contamination puts ground-nesting bumble bees, *Bombus* sp., at risk.”

- “Foraging of bumble bees, *Bombus* sp., can be impaired by neonicotinoids.”
- “Commercial hives can be heavily contaminated with pesticides.”
- “Honey bees can be killed by acute exposure to aerially dispersed seed coatings containing neonicotinoids. Chronic exposure can cause foragers to lose their way.”
- Salon article: “More than half of the purportedly “bee-friendly” plants sold at Home Depot, Lowe’s and Wal-Mart garden centers across the U.S. and Canada actually contain neonicotinoids — meaning gardens planted to save the bees, or even just planted under the assumption that they aren’t contributing to the die-offs, instead may be killing the pollinators.”
- Green Retail Decisions article: “Home Depot, BJ’s Collaborate to ban bee-killing pesticides.”

## Bee-action

- Promote health & numbers of bees
- Establish gardens, restoration sites
- Eliminate/reduce pesticides.
- *General pesticides kill everything!*

## Bee-action

- UC Berkeley Urban Bee Lab: observations at Leaning Pine Arboretum, Cal Poly SLO
- Plants from S. Africa, Australia, Central/South America are largely ignored by California native bees

## Bee-action

- California’s native bees evolved with native flowering plants
- Plant it and they will come...

## Lawns

- Used mostly by your neighbor’s dog
- Support nearly no wildlife
- 70-90% of your water bill!

## Bee-action

- Use California native plants!
- Tree of Life Nursery, SJC
- Fullerton Arboretum, Fullerton
- Golden West College, Huntington Beach
- Rancho Santa Ana Botanic Garden, Claremont
- Theodore Payne Foundation, Sunland.

## Take inspiration from nature...

- Beardtongues, *Penstemon* spp. - perennial
- Golden yarrow, *Eriophyllum confertiflorum* - perennial
- California buckwheat, *Eriogonum fasciculatum* - perennial
- *Phacelia* spp.: Several species, Seasonality, Annuals & perennials
  - Desert canterbury bells, *Phacelia campanularia* - annual
  - Tansy phacelia, *Phacelia tanacetifolia* - annual
  - Branching phacelia, *Phacelia ramosissima* - perennial
- Western sunflower, *Helianthus annuus* - annual
- Coastal goldenbush, *Isocoma menziesii* - perennial
- California poppy, *Eschscholzia californica* - annual or short-lived perennial

## Bee-action

- Provide nesting sites
- Open ground, bee holes, bee boxes

## References

- Allen, R.L. & F.M. Roberts, Jr. 2013. **Wildflowers of Orange County and the Santa Ana Mountains**. Laguna Wilderness Press, Laguna Beach, CA.
- Bornstein, C., D. Fross, and B. O'Brien. 2005. **California Native Plants for the Garden**. Cachuma Press, Los Olivos, CA.
- Bornstein, C., D. Fross, and B. O'Brien. 2011. **Reimagining the California Lawn: Water-conserving Plants, Practices, and Designs**. Cachuma Press, Los Olivos, CA.
- Frankie, G. 2014. **California Bees & Blooms**. A Guide for Gardeners and Naturalists. Heyday Press, Berkeley, CA.
- LeBuhn, G. 2013. **Field Guide to Common Bees of California**, Including Bees of the Western United States. California Natural History Guides. UC Press, Berkeley, CA.
- O'Toole, C. 2013. **Bees, A Natural History**. Firefly Books, Richmond Hill, Ontario, Canada.
- Ruben, G., & L. Warren. 2013. **California Native Landscape**. The Homeowner's Design Guide to Restoring its Beauty and Balance. Timber Press, Portland, OR.
- Koch, J., J. Strange, P. Williams. 2012. **Bumble Bees of the Western United States**. Pollinator Partnership. [http://www.xerces.org/wp-content/uploads/2008/09/Western\\_BB\\_guide.pdf](http://www.xerces.org/wp-content/uploads/2008/09/Western_BB_guide.pdf)
- Pollinator Partnership. **Poster: Bumble Bees of the Western United States**. <http://pollinator.org/wbbposter.htm>
- Ponder, M.V., G.W. Frankie, et al. 2013. **How to Attract and Maintain Pollinators in Your Garden**. UC ANR Publication 8498. <https://anrcatalog.ucdavis.edu/pdf/8498.pdf>
- Michener, C.D. 2007. **Bees of the World**, second edition. Johns Hopkins University Press, Baltimore, MD.
- Moisset, B., & S. Buchmann. **Bee Basics. An Introduction to Our Native Bees**. A USDA Forest Service and Pollinator Partnership Publication. [http://www.fs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb5306468.pdf](http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5306468.pdf)
- Williams, P.H., R.W. Thorp, L.L. Richardson, & S.R. Colla. **Bumble Bees of North America, An Identification Guide**. Princeton University Press, Princeton, NJ.