

Then and now: Documenting the squirrels of Southern California with collections and community science

Kayce Bell, Miguel Ordeñana, Lisa Gonzalez

Urban Nature Research Center, Natural History Museum of Los Angeles County, Los Angeles, CA, USA



Natural history specimens provide a tangible record of biodiversity through space and time. While these specimens are irreplaceable, the power of these data are amplified when combined with community science data. Southern California is heavily urbanized, but also encompasses a wide range of habitat types, from coastal scrub to high elevation conifer forests to low elevation desert. While some mammal species have managed to thrive in urban areas, it is unclear what types of habitat or what combination of landscape characteristics sustain each species. There are 15 species of sciurids in Southern California with variable responses to urbanization and human activities. In 2013 the Natural History Museum of Los Angeles County launched the Southern California Squirrel Survey, a community science project on iNaturalist. The goal of the project is to combine observations with specimen records to document where squirrels occur, identify the habitats each species is associated with, and compare how occurrences have changed through time.

species	museum specimens		observations	
	2010-2019	total	2010-2019	total
white-tailed antelope squirrel, <i>Ammospermophilus leucurus</i>	87	1698	392	977
San Joaquin antelope squirrel, <i>Ammospermophilus nelsoni</i> *	6	279	58	103
golden-mantled ground squirrel, <i>Callospermophilus lateralis</i>	1	344	23	41
Humboldt's flying squirrel, <i>Glaucomys oregonensis</i>	1	38	72	73
yellow-bellied marmot, <i>Marmota flaviventris</i>	0	3	0	3
Merriam's chipmunk, <i>Tamias merriami</i>	13	910	165	281
California chipmunk, <i>Tamias obscurus</i>	24	157	13	18
Panamint chipmunk, <i>Tamias panamintinus</i>	3	105	1	2
Lodgepole chipmunk, <i>Tamias speciosus</i>	0	769	36	62
California ground squirrel, <i>Otospermophilus beecheyi</i>	41	1140	3474	7504
rock squirrel, <i>Otospermophilus variegatus</i>	4	57	2	6
western gray squirrel, <i>Sciurus griseus</i>	30	423	772	1392
eastern fox squirrel, <i>Sciurus niger</i> *	13	60	4946	8551
Mohave ground squirrel, <i>Xerospermophilus mohavensis</i> *	0	190	1	1
round-tailed ground squirrel, <i>Xerospermophilus tereticaudus</i>	2	562	51	74

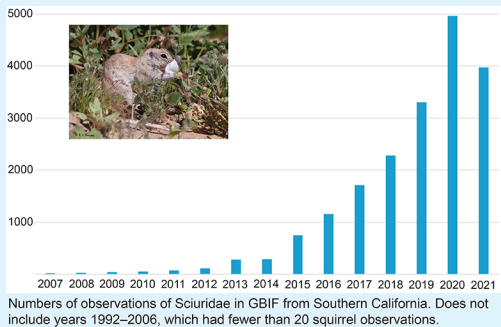
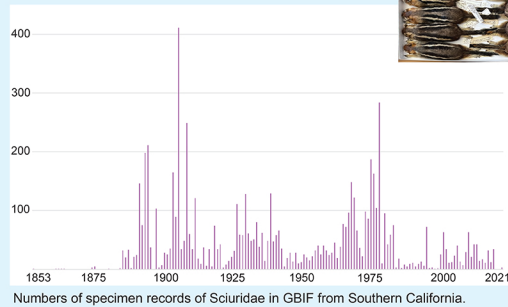
*species listed under the California Endangered Species Act
*introduced species

Results Highlights

- 19,086 observation records (8,941 in 2020–2021), 9,331 are in the Southern California Squirrel Survey
- 6,735 natural history collection specimen records
- Most specimens were collected before 2000 and most observations were made in 2015 or later.
- Earliest museum specimen (collected in 1853) and observation (1992) is the California ground squirrel (*Otospermophilus beecheyi*)
- Most observed species are also most common in urban areas, introduced eastern fox squirrel (*Sciurus niger*) and native California ground squirrel (*Otospermophilus beecheyi*)

Methods

- Downloaded all California observation and specimen records of Sciuridae through 2021 from GBIF, deleted NatureServe observations.
- Sorted to keep the 10 Southern California counties.
- Sorted the records for each species by time, county, and type (observation and specimen).



Conclusions

- Observations exceed specimen collection in the most recent decade, providing data for tracking introduced & rarely collected species.
- Need to increase both specimens and observations in the face of the current biodiversity crisis.
- Community science observations can provide valuable data on species ranges and population trends, particularly species that have not been the focus of recent specimen collecting or species of conservation concern such as the Mohave ground squirrel.
- Camera trap data document rarely observed or collected species, such as Humboldt's flying squirrel or urban western gray squirrels.
- Even research grade observations require verification (could be misidentified or mapped incorrectly) and many specimens need to be georeferenced.

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