Occurrence records and taxonomic voucher specimens for study of wild bee communities in early seral forests generated by wildfire, post-fire salvage logging, and intensive forest management in southwest Oregon.

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Abstract

Early seral forests regenerating after stand-replacing disturbance events can provide important habitat for populations of wild bees, an important group of pollinating insects. However, variability in the abundance and diversity of wild bee communities across different types of early seral forests is poorly understood, and can inform pollinator conservation efforts and sustainable forest management practices. In this study, we compared wild bee assemblages from early seral forests regenerating from three widespread stand-replacing disturbances across a gradient in stand ages in the Klamath Ecoregion of southwest Oregon using blue vane traps. Here, we present occurrence data for each bee specimen observed in the study, including voucher specimens deposited to the Oregon State Arthropod Collection.

Description of Collection

We sampled wild bee communities using blue vane traps at a variety of early seral forest sites (stand ages 2 – 20 years) in southwest Oregon during the 2019, 2021, and 2022 flight seasons. All forest stands had recently experienced one of three canopy-removing disturbances: clearcut timber harvest followed by herbicide applications on private lands (intensive forest management), stand-replacing wildfire (>75% basal area mortality) on public federal lands, or wildfire with post-fire salvage logging on public federal lands. Sampling was conducted as part of a study comparing wild bee diversity and community composition among early seral forests resulting from these three disturbance treatments (Frank 2023). We set blue vane traps for two-day sampling bouts in late spring mid-summer, with three traps in each forest stand. We filled traps with soapy water, and transferred specimens to 95% ethanol immediately upon collection and into fresh ethanol 1–3 days after collection.

Bee specimens were determined by author L. R. Best to the finest resolution possible using published identification resources and morphological analysis for groups with available resources. Bees in the family Andrenidae were determined with the aid of LaBerge (1969, 1975, 1977, 1980, 1985), and Timberlake (1956). Bees in the family Colletidae were determined with the aid of Snelling (1966a, 1966b, 1970), and bees in the family Halictidae were determined with the aid of Gardner and Gibbs (2022), Gibbs et al (2013), McGinley (1986), and Roberts (1973a, 1973b). Bees in the family Megachilidae were determined with the aid of

Bzdyk (2012), Gonzalez and Griswold (2013), Hurd and Michener (1955), Rust (1974), Sandhouse (1939), Sinha and Michener (1958), Sheffield et al (2011), but see also Sheffield (2020) and Portman (2023, March 21). Bees in the family Apidae were determined with the aid of Adlakha (1969), Brooks (1983, 1988), Daly (1973), Hurd and Linsley (1951), LaBerge (1956a, 1956b, 1961, 1963), O'Brien and Hurd (1965), Rightmyer (2008), Timberlake (1969), and Williams et al (2014). Keys in Michener (2007) were used to support subgeneric determinations within several genera.

For groups lacking identification resources relevant to the region and fauna, we used an iterative method supported by coI-mtDNA barcoded reference material (Ratnasingham & Hebert, 2007) and morphological analysis. We sequenced 47 specimens at the Canadian Center for DNA Barcoding, resulting in 31 barcode compliant sequences. Barcode sequences helped elucidate the identities of 19 species concepts, primarily within the genera Lasioglossum and Osmia. Taxonomic names were confirmed against the GBIF Backbone Taxonomy using the rgbif package version 3.7.9 (Chamberlain et al. 2024) using program R version 4.2.3 (R Core Team 2023).

We collected a total of 9909 bees, representing 120 species and all five families found in the state of Oregon. Ultimately 99.4% of specimens sampled were identified to the species level, 0.5% were identified to subgenus, and the remaining 0.1% (7 specimens) were identified to genus. Occurrence records for specimens representing unique combinations of species, sex, and sampling event are archived as an attached text file to this publication, including sampling date and approximate locality information. However, the reader is directed to the corresponding author for detailed locality data, sampling effort, abundance data, and ecological information about each location, including stand age and disturbance treatment category. We selected one voucher specimen for each sex of each species or morphospecies, and deposited these into the Oregon State Arthropod Collection (OSAC); accession record: OSAC_AC_2024_02_14-001.

Metadata

The dataset contains the following 38 fields, which have been mapped to darwinCore biodiversity data standards (https://dwc.tdwg.org/):

datasetName: The dataset name, ESFB-bees-OSAC-2024[version], is included in each record, in case these records are combined with other observational datasets. ESFB stands for the Early Seral Forest Biodiversity project.

basisOfRecord: All records refer to a preserved specimen, either pinned or in alcohol.

disposition: Indicates whether a specimen was accessioned into the OSAC as part of the voucher collection ('confirmedPresent') or not ('not retained'). Importantly, all records are based on preserved specimens examined by taxonomist Lincoln Best.

catalogNumber: If a voucher specimen for an observation was deposited into the OSAC, it is provisioned with a unique catalog number, which is presented on a printed label in both arabic human readable digits and a datamatrix barcode. As with the occurrenceID, the catalogNumber is represented in the datamatrix as a URL: http://osac.oregonstate.edu/SP/OSAC_XXXXXXXXXX, where the X's correspond to a unique 10-digit number. Observations based on specimens that were not accessioned into the museum (i.e., not retained) are not associated with a catalog number, and the field was left blank.

fieldNumber: The specimen ID number for this specific project, beginning with GSF (initials of the first author), followed by a numeric sequence in the order that a label was created for the specimen.

occurrenceID: A globally unique identification number for the observational record. It is cast differently depending on whether the voucher specimen was retained or not. For occurrence records based on specimens now housed in the collection, the occurrenceID has the prefix: 'http://osac.oregonstate.edu/SP/OSAC_' followed by the 10-digit museum-issued catalog number for the voucher specimen, e.g., http://osac.oregonstate.edu/SP/OSAC_0001300777. For occurrence records based on specimens not retained in the collection, 'SP/OSAC_' was replaced with 'OBS/[fieldNumber]', e.g., http://osac.oregonstate.edu/OBS/GSF9086. In both cases, these globally unique strings, which are also URLs, serve as hyperlinks to access the museum specimen or observation record.

eventType: Sample.

eventID: A project-specific identifier of a sampling event, formulated as a three-digit site number, plot (A, B, or C), and sampling round (1 or 2), e.g., 046-A-1. This is provided to link specimens collected during the same sampling event.

samplingProtocol: The method of sampling. All samples were collected using blue vane traps.

eventDate: The range of dates during which blue vane traps were open for a specific eventID. Usually a two-day period.

recordedBy: The names of the field crew that collected contents of each blue vane trap.

Location: Locality data for each specimen are provided in nine fields: *countryCode*, *stateProvince*, *county*, *locality*, *decimalLatitude*, *decimalLongitude*, *geodeticDatum*, *minimumElevation*, and *maximumElevation*. The locality field is the approximate distance and bearing from the nearest town or other geographic landmark.

Sampling locations were recorded with high-precision (+/- 1 m accuracy) GPS units. However, these are provided only to the nearest half-degree for publicly shared records to allow for coarse mapping in GBIF while also ensuring that detailed uses of the data directly attribute records to the dataset creators (i.e., the authors) rather than the data aggregator (i.e., GBIF). Similarly, minimumElevation and maximumElevation together provide a 100 m band in which the specimen was sampled. The dataGeneralization field provides this information for each record, and detailed geolocations are available by contacting the corresponding author.

Taxon: Taxonomic classification of each specimen, checked against the GBIF Backbone Taxonomy, including eight fields: kingdom, phylum, order, family, genus, specificEpithet, scientificName, and taxonRank. The scientificName field includes the full binomial with authority and date of publication. The taxonRank field reflects whether a specimen was identified to genus or species.

sex: Male or female

verbatimIdentification: A string representing the identification in the original record. Includes subgeneric identifications for some specimens not identified to species, in parentheses, and morphospecies groupings unique to this study (e.g., '*Lasioglossum* (*Dialictus*) sp. 6').

identifiedBy: All specimens were identified by author and taxonomist L. R. Best.

license: A creative commons license that allows users to share and adapt these data for non-commercial purposes, so long as proper attribution is made using the citation provided in bibliographicCitation. See: https://creativecommons.org/licenses/by-nc/4.0/ for details.

bibliographicCitation: Included so that each record contains the appropriate attribution for the original data.

rightsholder: Oregon State University, the organization that owns the rights to the data.

ownerInstitutionCode: OSAC, the organization that owns the object or information in the record.

institutionCode: OSAC, the organization with custody of the object or information referred to in the record.

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