Appendix A

Species Listing PROPOSAL Form:

Listing Endangered, Threatened, and Special Concern Species in Massachusetts

Scientific name: *Epeoloides pilosulus*

Current Listed Status (if any): None

Common name: Macropis Cuckoo Bee

Proposed Action:

__X__ Add the species, with the status of: Threatened
_____ Remove the species
_____ Change the species' status to: _____

Change the scientific name to: _____
Change the common name to: _____
(Please justify proposed name change.)

Proponent's Name and Address:

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Association, Institution or Business represented by proponent: Massachusetts Division of Fisheries & Wildlife

Proponent's Signature: Michael F. Veit
Michael W. Nelson

Date Submitted: March 1, 2023

Please submit to: Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries & Wildlife, 1 Rabbit Hill Road, Westborough, MA 01581

Justification

Justify the proposed change in legal status of the species by addressing each of the criteria below, as listed in the Massachusetts Endangered Species Act (MGL c. 131A) and its implementing regulations (321 CMR 10.00), and provide literature citations or other documentation wherever possible. Expand onto additional pages as needed but make sure you address all of the questions below. The burden of proof is on the proponent for a listing, delisting, or status change.

(1) Taxonomic status. Is the species a valid taxonomic entity? Please cite scientific literature.

- Yes, *Epeoloides pilosulus* (Cresson, 1878) is a valid species (Ascher & Pickering 2020).

(2) Recentness of records. How recently has the species been conclusively documented within Massachusetts?

- The most recent records are from 2022 (M.F. Veit, J. Milam, F. Morrison, collectors).

(3) Native species status. Is the species indigenous to Massachusetts?

- Yes (Mitchell 1962, Ascher & Pickering 2020, Veit et al. 2021)

(4) Habitat in Massachusetts. Is a population of the species supported by habitat within the state of Massachusetts?

- Yes, *E. pilosulus* is currently known from eight sites in four counties (Veit et al. 2021; M.F. Veit collection).

(5) Federal Endangered Species Act status. Is the species listed under the federal Endangered Species Act? If so, what is its federal status (Endangered or Threatened)

- No

(6) Rarity and geographic distribution.

(a) Does the species have a small number of occurrences (populations) and/or small size of populations in the state? Are there potentially undocumented occurrences in the state, and if so, is it possible to estimate the potential number of undocumented occurrences?

- *Epeoloides pilosulus* is very rare in Massachusetts, currently only known from eight sites in four counties (see Map 1 below). Additionally, there are three historical records from Massachusetts, all from 1927 (specimens in the Snow Entomological Museum Collection, Lawrence, Kansas, and the Bee Biology and Systematics Laboratory, Logan, Utah).
- *Epeoloides pilosulus* is a brood parasite of solitary bees in the genus *Macropis*. Two species of *Macropis* (*M. ciliata*, *M. nuda*) are uncommon to rare and have modern records in Massachusetts; a third (*M. patellata*) has no known records in the state since 1933. It is possible that other populations of *E. pilosulus* may occur where there are sufficiently large populations of nesting *Macropis* females.

(b) What is the extent of the species' entire geographic range, and where within this range are Massachusetts populations (center or edge of range, or peripherally isolated)? Is the species a state or regional endemic?

- In the United States, *E. pilosulus* ranges from New England south into Georgia in the East, and northwest through Wisconsin into North Dakota. In Canada this species' range extends from Nova Scotia west to Alberta (Mitchell 1962, Sheffield & Heron 2018, Ascher & Pickering 2020).

(7) Trends.

(c) Is the species decreasing (or increasing) in state distribution, number of occurrences, and/or population size? What is the reproductive status of populations? Is reproductive capacity naturally low? Has any long-term trend in these factors been documented?

- Due to an absence of collections across its entire range since 1960, *Epeoloides pilosulus* was suspected by many experts to be extinct, until it was rediscovered in Nova Scotia in 2002 (Sheffield et al. 2004). After its initial rediscovery, targeted efforts to relocate this species have met with some success, including in New England.

- Historical data on the bees of Massachusetts is limited, and often concentrated in localities frequented by collectors (near universities, vacation areas, and residences). This is especially true of rare or obscure species such as *E. pilosulus*. Therefore, it is not surprising that there are only three known pre-2018 records of *E. pilosulus* from Massachusetts, all from Needham (Norfolk County). Regionally, single modern records occur in other New England states including Connecticut, New Hampshire, and Maine, where in addition, each state has one historical record.

(8) Threats and vulnerability.

(d) What factors are driving a decreasing trend, or threatening reproductive status in the state? Please identify and describe any of the following threats, if present: habitat loss or degradation; predators, parasites, or competitors; species-targeted taking of individual organisms or disruption of breeding activity.

- *Epeoloides pilosulus* is a brood parasite of oil bees in the genus *Macropis*. Two species of *Macropis* (*M. ciliata*, *M. nuda*) are uncommon to rare in Massachusetts and a third (*M. patellata*) is possibly extirpated from the state (no records since 1933). The females of *Macropis* species are oil (and pollen) collecting specialists entirely dependent on species of yellow loosestrifes in the genus *Lysimachia* (family Primulaceae).
- *E. pilosulus* specimens have been collected in Massachusetts only at locations having large concentrations of *Lysimachia*. Presumably a large concentration of host plants is necessary to support a sufficiently large population of *Macropis* oil bees to sustain *E. pilosulus* parasitism. Of the yellow loosestrifes in Massachusetts, *Lysimachia quadrifolia* (Whorled Loosestrife) is the most common, and the species with which six of the seven modern Massachusetts records of *E. pilosulus* are associated.
- *L. quadrifolia* is relatively short-lived, and occurs in greatest concentrations in habitats managed for an open vegetation structure (particularly on sandplains), as well as powerline right-of-ways. Large populations of *L. quadrifolia* are threatened by factors including loss to development, fire suppression and/or lack of habitat management leading to reforestation and growth of competing vegetation, and browsing by overabundant deer.

(e) Does the species have highly specialized habitat, resource needs, or other ecological requirements? Is dispersal ability poor?

- Yes, *Epeoloides pilosulus* is a brood parasite of uncommon to rare, ecologically specialized oil bees in the genus *Macropis*. Native, oil-producing yellow *Lysimachia* species (*L. ciliata*, *L. quadrifolia*, and *L. terrestris*) are found throughout Massachusetts; however, *Macropis* oil bees are far rarer, and *E. pilosulus* rarer still.

Conservation goals.

What specific conservation goals should be met in order to change the conservation status or to remove the species from the state list? Please address goals for any or all of the following:

(a) State distribution, number of occurrences (populations), population levels, and/or reproductive rates
(b) Amount of protected habitat and/or number of protected occurrences
(c) Management of protected habitat and/or occurrences

- Modern records of *Epeoloides pilosulus* suggest that large, dense populations of native, oil-producing yellow *Lysimachia* plants are necessary to support populations of its *Macropis* host bees. Therefore, habitat management efforts should conserve and expand existing populations of these host plants, especially *L. quadrifolia*, at both known and potential *E. pilosulus* sites.

Literature cited, additional documentation, and comments.

Ascher, J.S., and J. Pickering. 2020. Discover Life bee species guide and world checklist (Hymenoptera: Apoidea: Anthophila). http://www.discoverlife.org/mp/20q?guide=Apoidea_species

Mitchell, T.B. 1962. *Bees of the Eastern United States*. North Carolina Agricultural Experiment Station Technical Bulletin No. 152, Raleigh, North Carolina. 557 pp.

Sheffield, C.S., and J. Heron. 2018. A new western Canadian record of *Epeoloides pilosulus* (Cresson), with discussion of ecological associations, distribution, and conservation status in Canada. *Biodiversity Data Journal* 6: e22837. https://bdj.pensoft.net/articles.php?id=22837

Sheffield, C.S., S.M. Rigby, R.F. Smith, and P.G. Kevan. 2004. The rare cleptoparasitic bee *Epeoloides pilosula* (Hymenoptera: Apoidea: Apidae) discovered in Nova Scotia, Canada, with distributional notes. *Journal of the Kansas Entomological Society* 77: 161-164.

Veit, M.F., J.S. Ascher, J. Milam, F.R. Morrison, and P.Z. Goldstein. 2021. A checklist of the bees of Massachusetts (Hymenoptera: Apoidea: Anthophila). *Journal of the Kansas Entomological Society* 94: 81-157.

Map 1. Current records of *Epeoloides pilosulus* in Massachusetts. Data from Michael Veit.