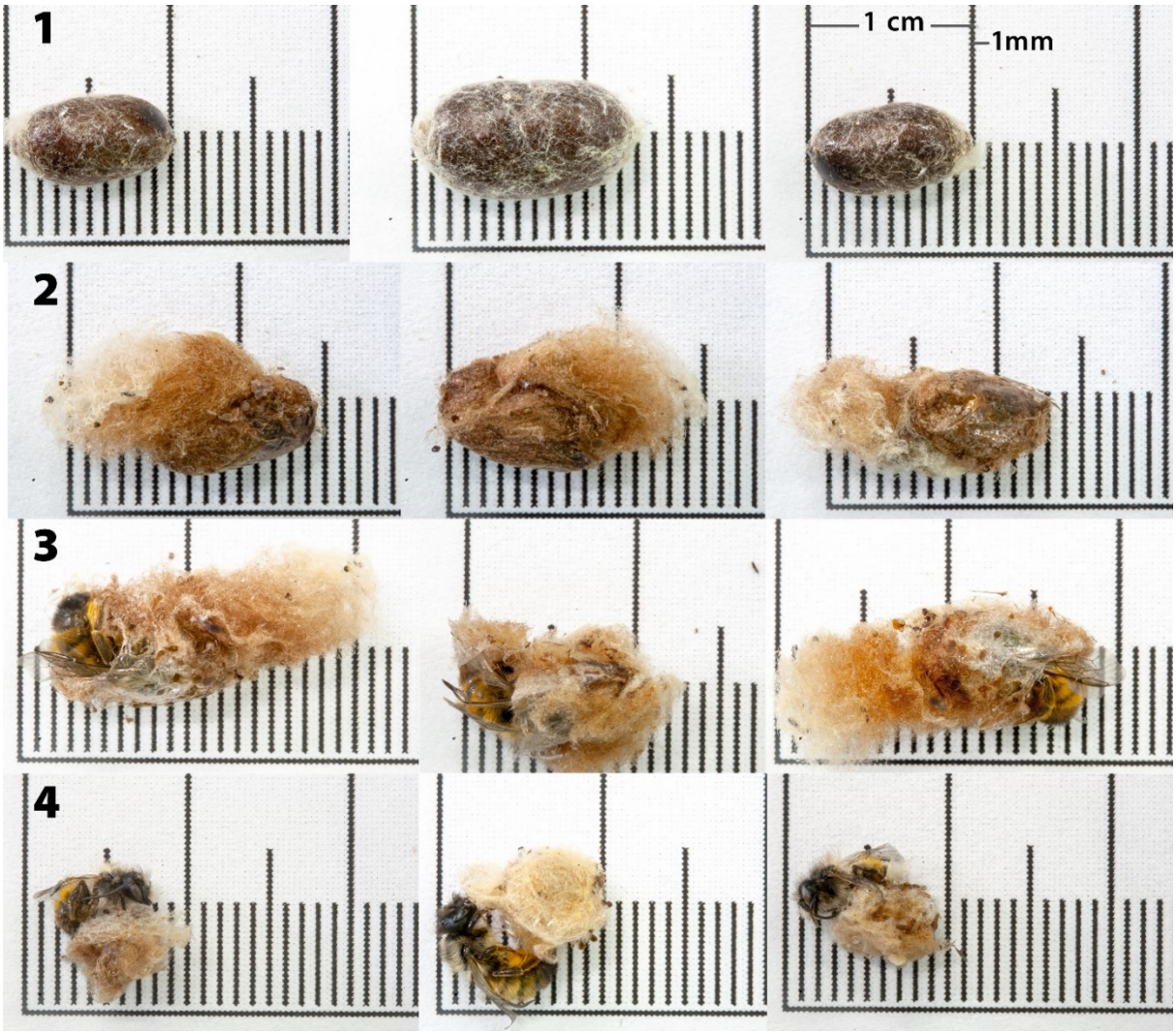

Figure S1. The degrees of cocoon development: (1) A fully developed cocoon that covered the whole bee body and consisted of a hard material; these cocoons were impossible to tear with bare hands but could be cut with a knife because they were sufficiently hard; (2) an almost-developed cocoon that covered the whole bee body but consisted of a soft material; these cocoons were impossible to cut with a knife because they were too soft, but they could be torn by hand; (3) an underdeveloped cocoon that covered only part of the bee body and was soft; and (4) a very underdeveloped cocoon that did not cover any part of the bee body and consisted only of "woolly" matter.

Table S1. Elemental composition of pollen pools used in the feeding experiment.

	P %	K ppm	Na ppm	Zn ppm	Cu ppm
Control-Osmia	0.57 ± 0.02	6149.0 ± 231.7	74.1 ± 29.8	61.4 ± 8.3	10.5 ± 1.3
Apis1	0.61 ± 0.02	6045.8 ± 126.5	62.2 ± 25.3	51.0 ± 3.3	12.2 ± 0.9
Apis2	0.56 ± 0.03	6334.9 ± 299.7	72.9 ± 26.2	53.4 ± 2.5	12.7 ± 0.5
-CuZn1	0.61 ± 0.03	5441.6 ± 122.5	64.3 ± 20.2	36.9 ± 2.7	7.9 ± 0.9
-CuZn2	0.60 ± 0.01	5501.6 ± 511.7	62.4 ± 25.6	34.1 ± 1.5	7.2 ± 1.1
-KP	0.44 ± 0.01	4540.3 ± 162.2	88.7 ± 22.8	47.8 ± 4.9	10.1 ± 1.0
-NaP	0.46 ± 0.02	5426.9 ± 600.0	41.4 ± 19.7	50.1 ± 2.9	14.6 ± 1.6

Table S2. Botanical composition of pollen pools used in the feeding experiment.

Control-Osmia	**Pollen grains**	
	Number	**%**
Quercus	388	41.0
Salix	274	29.0
Ranunculus	63	6.7
Rubus	48	5.1
Prunus	37	3.9
Acer	39	4.1
Poaceae	15	1.6
Juglans	36	3.8
other Brassicaceae	11	1.2
Trifolium repens	8	0.8
Papaver	8	0.8
Tilia	4	0.4
Aesculus	6	0.6
Filipendula	2	0.2
Plantago	4	0.4
Taraxacum	3	0.3
Total	946	100.0

Apis1	**Pollen grains**	
	Number	**%**
Brasssica napus	366	36.3
Acer	267	26.5
Rubus typ	191	18.9
Quercus	83	8.2
Trifolium repens	29	2.9
Centaurea cyanus	10	1.0

Prunus	20	2.0
Fragaria	6	0.6
Anthriscus	4	0.4
Pinus	2	0.2
Aesculus	1	0.1
Helianthus	2	0.2
Heracleum	2	0.2
Salix	1	0.1
Tilia	1	0.1
Cirsium	7	0.7
Chenopodiaceae	5	0.5
Solidago	5	0.5
Malus	3	0.3
Viola tricolor	2	0.2
Carex	1	0.1
Total	1008	100.0

Apis2	**Pollen grains**	
	Number	**%**
Parthenocissus	517	44.0
Filipendula	429	36.5
Trifolium repens	85	7.2
Rubus	19	1.6
other Brassicaceae	19	1.6
Cirsium	14	1.2
Sanguisorba	38	3.2
Plantago	10	0.9
Convolvulus	4	0.3
Frangula alnus	3	0.3
Epilobium	3	0.3
Malus	7	0.6
Taraxacum	2	0.2
Tilia	5	0.4
Poaceae	7	0.6
Ranunculus	2	0.2
Rumex	2	0.2
Prunus	4	0.3
Lamium	2	0.2
Aesculus	1	0.1
Papaver	1	0.1
Total	1174	100.0

-CuZn1	**Pollen grains**	
	Number	**%**
Brasssica napus	912	91.5

Acer	28	2.8
Poaceae	11	1.1
Prunus	9	0.9
Quercus	7	0.7
Anthriscus	16	1.6
Pinus	6	0.6
Carex	1	0.1
Ranunculus	3	0.3
Salix	2	0.2
Taraxacum	2	0.2
Total	997	100.0

-CuZn2	**Pollen grains**	
	Number	**%**
Brassica napus	907	89.3
Solidago	15	1.5
Prunus	11	1.1
Acer	13	1.3
Quercus	10	1.0
Centaurea cyanus	9	0.9
Rubus	4	0.4
Achillea	2	0.2
Ranunculus	3	0.3
Salix	6	0.6
Taraxacum	6	0.6
Aesculus	6	0.6
Caprifoliaceae	2	0.2
Carex	1	0.1
Chenopodiaceae	1	0.1
Convolvulus	1	0.1
Malus	1	0.1
Parthenocissus	1	0.1
Pinus	6	0.6
Poaceae	1	0.1
Zea mays	1	0.1
Rumex	3	0.3
Plantago	2	0.2
Anthriscus	1	0.1
Cirsium	1	0.1
Heracleum	1	0.1
Trifolium repens	1	0.1
Total	1016	100.0

-KP	**Pollen grains**	
	Number	**%**

Anthriscus	362	24.8
Filipendula	237	16.2
other Brassicaceae	339	23.2
Salix	55	3.8
Cirsium	103	7.0
Centaurea cyanus	75	5.1
Trifolium repens	75	5.1
Centaurea jacea	53	3.6
Plantago	26	1.8
Heracleum	42	2.9
Solidago	13	0.9
Malus	9	0.6
Trifolium pretense	11	0.8
Rubus	7	0.5
Pinus	3	0.2
Achillea	3	0.2
Arctium	4	0.3
Betula	2	0.1
Lotus	2	0.1
Prunus	4	0.3
Quercus	8	0.5
Vicia	4	0.3
Acer	2	0.1
Aesculus	3	0.2
Chenopodiaceae	4	0.3
Poaceae	1	0.1
Rumex	2	0.1
Viola tricolor	8	0.5
Taraxacum	2	0.1
Caryophyllaceae	1	0.1
Parthenocissus	1	0.1
Total	1461	100.0

-NaP	**Pollen grains**	
	Number	**%**
Aesculus	608	65.0
Helianthus	85	9.1
Achillea	34	3.6
Taraxacum	47	5.0
Solidago	26	2.8
Salix	36	3.8
Brassicaceae	28	3.0
Rumex	15	1.6
Filipendula	14	1.5
Poaceae	7	0.7
Anthriscus	7	0.7

Prunus	3	0.3
Betula	2	0.2
Centaurea cyanus	4	0.4
Centaurea jacea	3	0.3
Chenopodiaceae	3	0.3
Lamium	1	0.1
Ranunculus	2	0.2
Rubus	1	0.1
Quercus	1	0.1
Zea mays	1	0.1
Acer	2	0.2
Plantago	2	0.2
Papaver	1	0.1
Parthenocissus	1	0.1
Pinus	1	0.1
Trifolium repens	1	0.1
Total	936	100.0