

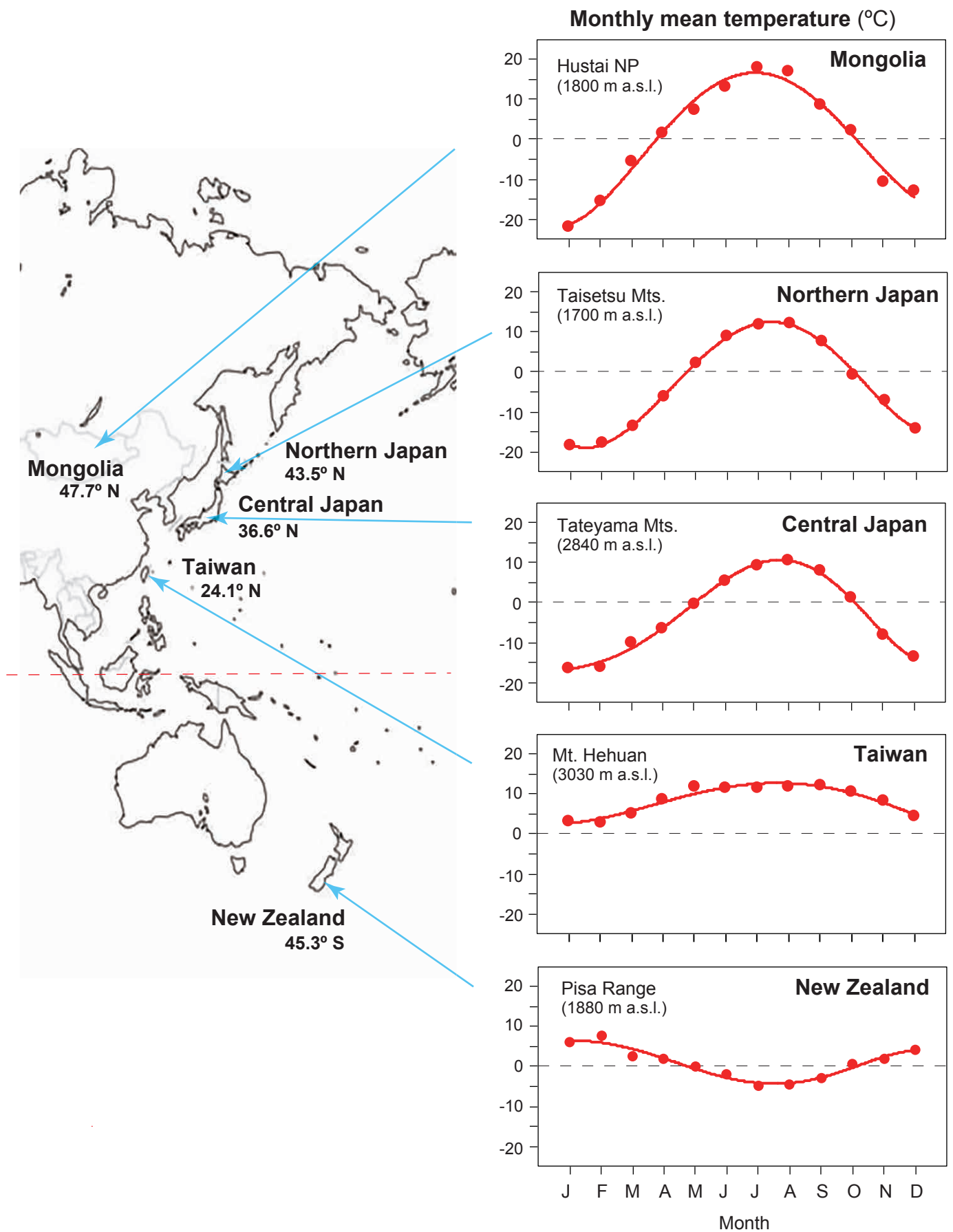


Figure S1 Location of study reagonis and the monthly-mean air temperature in each region. Air temperature was measured at a 1.5 m height throughout the year during the research period at each site. Because there was no available data for the NZ sites (Oldman Range and Remarkables Range), data of Pisa Range (close to Oldman Range) is shown.
Data source: Mark A. F. et al. (2006) J Royal Soc NZ 36: 111–128.

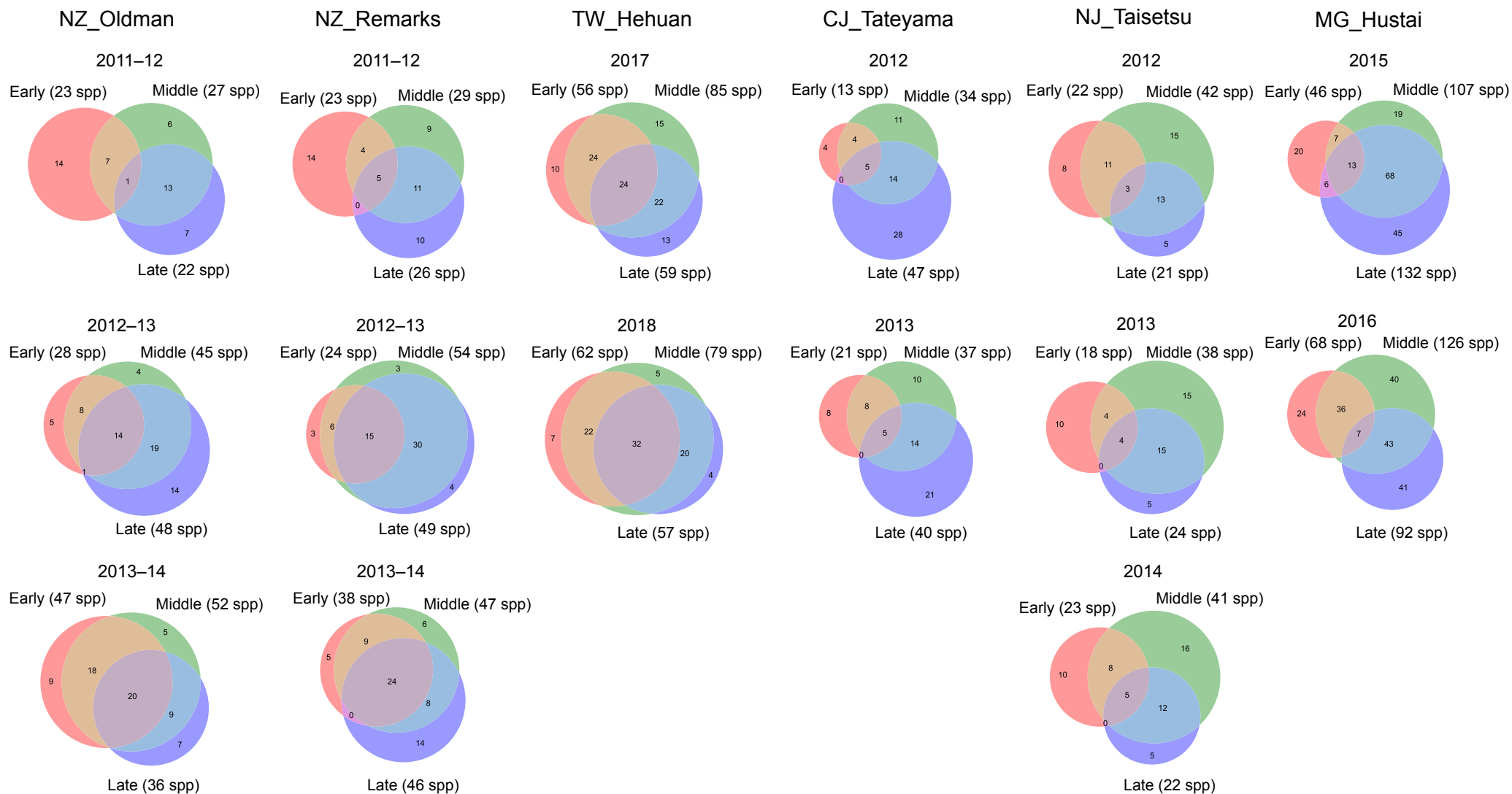


Figure S2 Venn diagrams of seasonal overlap of flowering species at each site in each year. Flowering season is classified into early (red), middle (green), and late season (blue). The number of species at flowering in each season is indicated. NZ_Oldman: Oldman Range in New Zealand, NZ_Remarks: Remarkables Range in New Zealand, TW_Hehuan: Mt. Hehuan-shan in Taiwan, CJ_Tateyama: Tateyama Mts. in central Japan, NJ_Taisetsu: Taisetsu Mts. in northern Japan, MG_Hustai, Hustai National Park in Mongolia.

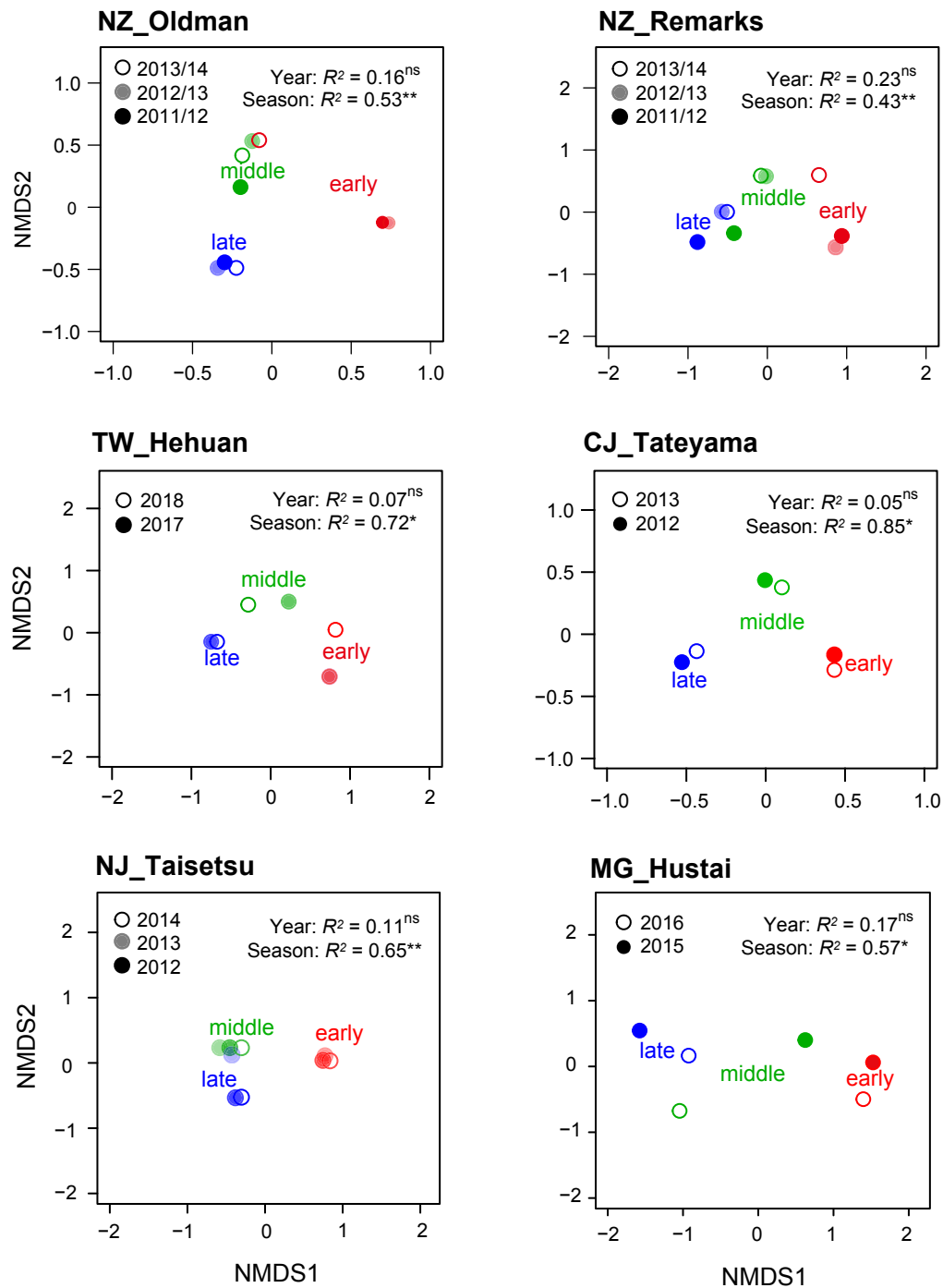


Figure S3 NMDS results of the seasonal changes in floral composition of alpine-plant communities in each year at each site. Flowering season is classified into early (red), middle (green), and late season (blue). NZ_Oldman: Oldman Range in New Zealand, NZ_Remarks: Remarkables Range in New Zealand, TW_Hehuan: Mt. Hehun-shan in Taiwan, CJ_Tateyama: Tateyama Mts. in central Japan, NJ_Taisetsu: Taisetsu Mts. in northern Japan, MG_Hustai, Hustai National Park in Mongolia. Results of PERMANOVA are shown.

Table S1a Flowering record and visitor type of individual species at Oldman site in New Zealand.

Plant species	Visitor type	2011–12			2012–13			2013–14		
		Early	Middle	Late	Early	Middle	Late	Early	Middle	Late
<i>Abrotanella caespitosa</i>	fly type					1			1	
<i>Anaphalioides bellidioides</i>	fly type					1	1	1	1	
<i>Brachycome sinclairii</i>	fly type	1	1		1	1	1	1	1	1
<i>Brachyglottis bellidioides</i>	fly type					1	1		1	1
<i>Cardamine corymbosa</i>	fly type				1		1	1	1	
<i>Celmisia argentea</i>	fly type						1		1	1
<i>Celmisia brevifolia</i>	fly type	1			1	1		1	1	
<i>Celmisia gracilentia</i>	fly type			1			1			1
<i>Celmisia haastii</i>	fly type	1	1		1	1	1	1	1	
<i>Celmisia prorepens</i>	fly type					1	1	1	1	1
<i>Celmisia viscosa</i>	fly type	1	1			1		1	1	
<i>Chionohebe ciliolata</i>	fly type						1		1	
<i>Chionohebe densifolia</i>	fly type	1			1			1		
<i>Chionohebe glabra</i>	fly type									1
<i>Chionohebe thomsonii</i>	fly type	1	1		1	1	1	1	1	1
<i>Craspedia incana</i>	fly type		1	1		1	1		1	
<i>Craspedia lanata</i>	fly type					1	1	1	1	
<i>Epilobium purpuratum</i>	fly type		1	1			1	1	1	1
<i>Euphrasia zelandica</i>	fly type			1			1			1
<i>Gentianella bellidifolia</i>	fly type		1	1	1	1	1	1	1	1
<i>Hectorella caespitosa</i>	fly type	1	1		1	1	1	1	1	
<i>Kelleria childii</i>	fly type		1	1	1	1	1	1	1	1
<i>Montia sessiliflora</i>	fly type					1	1		1	1
<i>Oxalis magellanica</i>	fly type		1	1		1	1	1	1	1
<i>Phyllachne rubula</i>	fly type		1	1		1	1		1	1
<i>Pimelea oreophila</i>	fly type	1			1	1	1	1	1	
<i>Psychrophila obtusa</i>	fly type	1			1	1		1	1	
<i>Ranunculus ensysii</i>	fly type	1			1			1	1	
<i>Ranunculus gracilipes</i>	fly type	1			1	1		1		
<i>Ranunculus pachyrrhizus</i>	fly type	1	1		1	1	1	1	1	1
<i>Raoulia grandiflora</i>	fly type		1	1	1	1	1	1	1	1
<i>Raoulia hectorii</i> var. <i>hectorii</i>	fly type		1	1		1	1	1	1	1
<i>Raoulia hectorii</i> var. <i>mollis</i>	fly type						1		1	1
<i>Raoulia subsericea</i>	fly type						1		1	1
<i>Raoulia subulata</i>	fly type			1		1	1			1
<i>Abrotanella inconspicua</i>	mixed type	1			1			1	1	
<i>Anisotome flexuosa</i>	mixed type	1	1	1	1	1	1	1	1	
<i>Anisotome imbricata</i>	mixed type	1			1	1		1	1	
<i>Celmisia sessiliflora</i>	mixed type		1			1	1	1	1	1
<i>Dracophyllum muscoides</i>	mixed type	1	1		1	1	1	1	1	1
<i>Gaultheria nubicola</i>	mixed type		1		1	1	1	1	1	1
<i>Gaultheria parvula</i>	mixed type					1	1	1	1	1
<i>Kelleria villosa</i>	mixed type		1	1	1	1	1	1	1	1
<i>Ourisia glandulosa</i>	mixed type					1	1	1	1	1
<i>Phyllachne colensoi</i>	mixed type		1	1		1	1	1	1	1
<i>Ranunculus multiscapus</i>	mixed type					1	1	1	1	
<i>Wahlenbergia albomarginata</i>	mixed type		1	1		1	1		1	1
<i>Wahlenbergia pygmaea</i>	mixed type						1			
<i>Acaena saccaticupula</i>	unknown		1			1	1	1	1	1
<i>Aciphylla hectori</i>	unknown					1	1	1		
<i>Anisotome aromatica</i>	unknown							1		
<i>Anisotome lanuginosa</i>	unknown	1			1	1		1	1	
<i>Celmisia laricifolia</i>	unknown	1			1	1		1	1	1
<i>Colobanthus acicularis</i>	unknown			1			1		1	1
<i>Colobanthus apetalus</i>	unknown			1						1
<i>Colobanthus buechananii</i>	unknown							1	0	0
<i>Epilobium porphyrium</i>	unknown		1	1	1	1	1	1	1	1
<i>Epilobium tasmanicum</i>	unknown									1
<i>Geum pusillum</i>	unknown			1						
<i>Gnaphalium mackayi</i>	unknown			1			1			1
<i>Hebe buechananii</i>	unknown						1		1	
<i>Hebe pauciramosa</i>	unknown		1			1	1		1	
<i>Hebe poppelwellii</i>	unknown						1			
<i>Leptinella goyenii</i>	unknown	1			1	1		1		
<i>Leptinella pectinata</i>	unknown	1		1	1	1		1	1	
<i>Lobelia glaberrima</i>	unknown		1	1			1		1	1
<i>Lobelia linnaeoides</i>	unknown						1			
<i>Myosotis pulvinaris</i>	unknown	1			1			1		
<i>Myosotis pygmaea</i>	unknown	1			1			1		
<i>Plantago lanigera</i>	unknown	1						1		
<i>Taraxacum magellanicum</i>	unknown		1			1		1	1	
<i>Viola cunninghamii</i>	unknown		1			1		1	1	

Table S1b Flowering record and visitor type of individual species at Remarks site in New Zealand.

Plant species	Visitor type	2011–12			2012–13			2013–14		
		Early	Middle	Late	Early	Middle	Late	Early	Middle	Late
<i>Abrotanella caespitosa</i>	fly type				1	1			1	
<i>Anapharioides bellidioides</i>	fly type		1	1		1	1	1	1	1
<i>Brachyglottis bellidioides</i>	fly type		1	1		1	1		1	1
<i>Brachyscome sinclairii</i>	fly type	1	1	1	1	1	1	1	1	1
<i>Cardamine corymbosa</i>	fly type		1		1	1	1	1	1	1
<i>Celmisia haastii</i>	fly type		1		1	1	1	1	1	1
<i>Chionohebe densifolia</i>	fly type	1			1	1		1	1	
<i>Chionohebe thomsonii</i>	fly type	1			1	1		1	1	
<i>Craspedia incana</i>	fly type		1			1	1		1	1
<i>Craspedia lanata</i>	fly type		1			1	1	1	1	
<i>Craspedia uniflora</i>	fly type					1	1		1	
<i>Epilobium purpuratum</i>	fly type		1	1		1	1			1
<i>Euphrasia zelandica</i>	fly type		1	1		1	1		1	1
<i>Gentianella bellidifolia</i>	fly type			1			1			1
<i>Hectorella caespitosa</i>	fly type		1		1	1	1	1	1	1
<i>Kelleria childii</i>	fly type		1	1	1	1	1	1	1	1
<i>Kelleria dieffenbachii</i>	fly type	1				1	1	1	1	1
<i>Kelleria paludosa</i>	fly type		1	1		1	1		1	1
<i>Montia sessiliflora</i>	fly type		1	1		1	1	1	1	1
<i>Ourisia caespitosa</i>	fly type	1			1	1	1	1	1	1
<i>Pimelea oreophila</i>	fly type	1				1	1	1	1	1
<i>Psychrophila obtusa</i>	fly type	1			1			1	1	
<i>Ranunculus gracilipes</i>	fly type	1			1	1	1	1	1	1
<i>Ranunculus pachyrrhizus</i>	fly type		1					1	1	
<i>Raoulia grandiflora</i>	fly type	1	1	1	1	1	1	1	1	1
<i>Raoulia hectorii</i> var. <i>hectorii</i>	fly type	1	1			1	1	1	1	1
<i>Raoulia subsericea</i>	fly type			1		1	1			1
<i>Raoulia subulata</i>	fly type			1		1	1			1
<i>Aciphylla kirkii</i>	beetle type				1	1	1	1	1	
<i>Anisotome imbricata</i>	mixed type	1			1	1	1	1	1	
<i>Celmisia sessiliflora</i>	mixed type	1	1			1	1		1	1
<i>Dracophyllum muscoides</i>	mixed type	1	1		1	1	1	1	1	1
<i>Gaultheria nubicola</i>	mixed type		1	1		1	1	1	1	1
<i>Gaultheria parvula</i>	mixed type					1	1	1	1	1
<i>Ourisia glandulosa</i>	mixed type	1	1	1	1	1	1	1	1	1
<i>Phyllachne colensoi</i>	mixed type	1	1	1		1	1	1	1	1
<i>Ranunculus multiscapus</i>	mixed type	1	1	1	1	1	1	1	1	1
<i>Wahlenbergia albomarginata</i>	mixed type		1	1		1	1		1	1
<i>Abrotanella inconspicua</i>	unknown	1			1	1		1	1	
<i>Acaena saccaticupula</i>	unknown		1			1	1	1	1	1
<i>Anisotome aromatica</i>	unknown				1	1		1	1	
<i>Anisotome capillifolia</i>	unknown						1			
<i>Anisotome lanuginosa</i>	unknown	1			1	1		1		
<i>Celmisia laricifolia</i>	unknown					1		1	1	1
<i>Colobanthus acicularis</i>	unknown			1		1	1		1	1
<i>Colobanthus apetalus</i>	unknown			1		1				1
<i>Coprosma perpusilla</i>	unknown			1						1
<i>Dolichoglottis lyallii</i>	unknown					1	1		1	1
<i>Dracophyllum kirkii</i>	unknown					1	1		1	
<i>Epilobium pernitens</i>	unknown									1
<i>Epilobium porphyrium</i>	unknown		1			1	1	1	1	1
<i>Epilobium tasmanicum</i>	unknown		1	1		1	1		1	
<i>Gaultheria crassa</i>	unknown							1		
<i>Geum cockaynei</i>	unknown		1	1		1	1			1
<i>Gingidia decipiens</i>	unknown	1			1	1	1		1	
<i>Gnaphalium mackayi</i>	unknown			1			1			1
<i>Haastia sinclairii</i>	unknown					1				
<i>Hebe haastii</i>	unknown	1					1			
<i>Leptinella goyenii</i>	unknown	1			1			1		
<i>Leptinella pectinata</i>	unknown	1	1		1	1	1	1	1	1
<i>Leucogenes grandiceps</i>	unknown								1	
<i>Lobelia glaberrima</i>	unknown			1		1	1			1
<i>Lobelia linnaeoides</i>	unknown					1	1			1
<i>Muehlenbeckia axillaris</i>	unknown									1
<i>Myosotis pulvinaris</i>	unknown				1					
<i>Myosotis tenericaulis</i>	unknown							1		
<i>Plantago lanigera</i>	unknown	1						1		
<i>Raoulia youngii</i>	unknown			1		1	1			1
<i>Taraxacum magellanicum</i>	unknown			1						1
<i>Viola cunninghami</i>	unknown		1			1	1	1	1	1

Table S1c Flowering record and visitor type of individual species at Hehuanshan site in Taiwan.

Plant species	Visitor type	2017			2018		
		Early	Middle	Late	Early	Middle	Late
<i>Aconitum fukutomei</i>	bee type			1		1	1
<i>Adenophora morrisonensis</i>	bee type		1	1		1	1
<i>Aletris formosana</i>	bee type		1	1	1	1	
<i>Cirsium arisanense</i>	bee type		1	1	1	1	
<i>Clinopodium chinense</i>	bee type		1	1		1	1
<i>Clinopodium laxiflorum</i>	bee type		1	1	1	1	1
<i>Codonopsis kawakamii</i>	bee type		1	1		1	1
<i>Elaeagnus thunbergii</i>	bee type	1					
<i>Gaultheria itoana</i>	bee type	1	1	1	1	1	
<i>Gentiana davidii</i> var. <i>formosana</i>	bee type		1	1		1	1
<i>Lonicera acuminata</i>	bee type		1	1	1	1	
<i>Lonicera kawakamii</i>	bee type	1	1				
<i>Origanum vulgare</i>	bee type		1	1	1	1	1
<i>Pedicularis verticillata</i>	bee type	1	1	1	1	1	1
<i>Rosa sericea</i> var. <i>morrisonensis</i>	bee type		1		1	1	
<i>Rubus croceacanthus</i>	bee type	1	1				
<i>Rubus rolfei</i>	bee type	1	1	1	1	1	1
<i>Tripterospermum lanceolatum</i>	bee type			1			1
<i>Anaphalis morrisonicola</i>	fly type		1	1	1	1	1
<i>Anemone stolonifera</i>	fly type				1	1	
<i>Arabidopsis lyrata</i> ssp. <i>kamchatica</i>	fly type	1	1	1	1	1	1
<i>Arenaria subpilosa</i>	fly type		1	1		1	
<i>Arisaema formosanum</i>	fly type	1					
<i>Astilbe macroflora</i>	fly type	1					
<i>Barbarea orthoceras</i>	fly type	1	1	1	1	1	1
<i>Berberis morrisonensis</i>	fly type	1	1		1	1	
<i>Carpesium nepalense</i>	fly type			1			1
<i>Cerastium trigynum</i> var. <i>morrisonense</i>	fly type	1	1	1	1	1	1
<i>Clematis montana</i>	fly type	1	1		1		
<i>Conioselinum morrisonense</i>	fly type			1		1	1
<i>Cynoglossum alpestre</i>	fly type		1	1		1	1
<i>Dianthus pygmaeus</i>	fly type	1	1	1	1	1	1
<i>Epilobium amurense</i>	fly type		1	1		1	1
<i>Epilobium hohuanense</i>	fly type		1	1	1	1	1
<i>Epilobium platystigmatosum</i>	fly type					1	
<i>Filipendula kiraishiensis</i>	fly type	1	1		1	1	
<i>Fragaria hayatai</i>	fly type	1	1		1	1	
<i>Galium echinocarpum</i>	fly type	1	1	1	1	1	1
<i>Gentiana arisanensis</i>	fly type	1	1	1	1	1	1
<i>Hieracium morii</i>	fly type	1	1	1		1	1
<i>Hypericum nagasawae</i>	fly type	1	1	1	1	1	1
<i>Ixeridium transnokoense</i>	fly type			1		1	1
<i>Leontopodium microphyllum</i>	fly type	1	1		1		
<i>Malaxis monophyllos</i>	fly type	1	1				
<i>Parnassia palustris</i>	fly type		1	1		1	1
<i>Pimpinella niitakayamensis</i>	fly type	1	1	1	1	1	1
<i>Polygonum runcinatum</i>	fly type		1	1	1	1	1
<i>Potentilla leuconota</i> var. <i>morrisonicola</i>	fly type	1	1	1	1	1	1
<i>Potentilla matsumurae</i> var. <i>pilosa</i>	fly type	1					
<i>Ranunculus cheiophyllus</i>	fly type	1	1		1	1	
<i>Ranunculus formosa-montanus</i>	fly type	1	1	1	1	1	1
<i>Ranunculus junipericola</i>	fly type	1	1				
<i>Ranunculus taiwanensis</i>	fly type	1	1			1	1
<i>Rhododendron pseudochrysanthum</i>	fly type	1	1		1	1	
<i>Sibbaldia procumbens</i>	fly type		1				
<i>Silene morrisonmontana</i>	fly type			1		1	1
<i>Sorbus randaiensis</i>	fly type	1					
<i>Solidago virgaurea</i> subsp. <i>leiocarpa</i>	fly type	1	1	1	1	1	1
<i>Spiraea hayatana</i>	fly type	1	1	1	1	1	1
<i>Spiraea morrisonicola</i>	fly type	1	1		1	1	
<i>Swertia tozanensis</i>	fly type			1			1

<i>Tharictrum urbaini</i>	fly type	1	1		1		
<i>Trollius taihasenzanensis</i>	fly type	1			1		
<i>Valeriana flaccidissima</i>	fly type	1	1	1	1	1	
<i>Veratrum formosanum</i>	fly type		1		1	1	
<i>Veronica morrisonicola</i>	fly type	1	1		1	1	1
<i>Viburnum betulifolium</i>	fly type	1			1		
<i>Platanthera mandarinorum</i> subsp. <i>pachyglossa</i>	beetle type		1		1	1	
<i>Platanthera sachalinensis</i>	moth type		1			1	
<i>Anaphalis nepalensis</i>	mixed type			1		1	1
<i>Corydalis ophiocarpa</i>	mixed type	1	1			1	1
<i>Cotoneaster apiculatus</i>	mixed type	1					
<i>Cotoneaster morrisonensis</i>	mixed type	1	1		1	1	
<i>Erigeron morrisonensis</i>	mixed type	1	1	1	1	1	1
<i>Eupatorium formosanum</i>	mixed type			1	1	1	1
<i>Euphrasia transmorrisonensis</i>	mixed type	1	1	1	1	1	1
<i>Gentiana scabrada</i> var. <i>punculata</i>	mixed type	1	1	1	1	1	1
<i>Geranium hayatanum</i>	mixed type	1	1	1	1	1	1
<i>Impatiens uniflora</i>	mixed type			1		1	1
<i>Ixeris chinensis</i>	mixed type		1	1	1	1	1
<i>Lilium formosanum</i>	mixed type	1	1		1	1	
<i>Picris hieracioides</i> subsp. <i>morrisonensis</i>	mixed type	1	1	1	1	1	1
<i>Polygonum cuspidatum</i>	mixed type		1	1	1	1	1
<i>Primula miyabeana</i>	mixed type	1	1		1	1	
<i>Prunella vulgaris</i> ssp. <i>asiatica</i> var. <i>nanhutashanensis</i>	mixed type		1		1	1	1
<i>Rosa transmorrisonensis</i>	mixed type	1	1	1	1	1	
<i>Rubia akane</i> var. <i>erecta</i>	mixed type	1	1		1	1	
<i>Sedum morrisonense</i>	mixed type		1	1	1	1	1
<i>Senecio nemorensis</i>	mixed type			1		1	1
<i>Swertia macrosperma</i>	mixed type		1	1		1	1
<i>Valeriana fauriei</i>	mixed type	1	1	1	1	1	1
<i>Ainsliaea latifolia</i> subsp. <i>henryi</i>	unknown		1		1		
<i>Amitostigma alpestre</i>	unknown		1				
<i>Circaea alpina</i> subsp. <i>imaicola</i>	unknown		1	1			
<i>Clematis tsugetorum</i>	unknown		1			1	
<i>Cucubalus baccifer</i>	unknown		1		1	1	1
<i>Deutzia pulchra</i>	unknown					1	
<i>Galium formosense</i>	unknown		1	1		1	1
<i>Ligularia kojimae</i>	unknown		1				
<i>Listera morrisonicola</i>	unknown	1					
<i>Myriactis humilis</i>	unknown			1			1
<i>Ophiopogon japonicus</i>	unknown		1				
<i>Oreorchis indica</i>	unknown	1					
<i>Paris polyphylla</i> var. <i>stenophylla</i>	unknown	1	1				
<i>Photinia niitakayamensis</i>	unknown	1	1		1		
<i>Platanthera brevicarata</i>	unknown		1		1	1	
<i>Polygala japonica</i>	unknown			1			
<i>Polygonum chinense</i>	unknown	1	1		1	1	
<i>Rubia lanceolata</i>	unknown		1				
<i>Stellaria saxatilis</i>	unknown	1	1			1	1
<i>Valeriana kawakamii</i>	unknown		1		1		1

Table S1d Flowering record and visitor type of individual species at Tateyama site in central Japan.

Plant species	Visitor type	2012			2013		
		Early	Middle	Late	Early	Middle	Late
<i>Aconitum senanense</i>	bee type			1			1
<i>Arctica nana</i>	bee type	1			1		
<i>Arctous alpina</i>	bee type	1			1		
<i>Campanula dasyantha</i> subsp. <i>chamissonis</i>	bee type			1			
<i>Campanula lasiocarpa</i>	bee type			1		1	1
<i>Cirsium babanum</i>	bee type			1			1
<i>Diapensia lapponica</i>	bee type	1	1		1		
<i>Elliottia bracteata</i>	bee type			1			1
<i>Gaultheria pyrolloides</i>	bee type			1			1
<i>Gentiana algida</i>	bee type			1			1
<i>Gentiana makinoi</i>	bee type			1			1
<i>Gentiana nipponica</i>	bee type		1	1			1
<i>Hypericum kamtschaticum</i>	bee type			1			1
<i>Nepeta subsessilis</i>	bee type			1			1
<i>Pedicularis chamissonis</i>	bee type		1	1		1	1
<i>Pedicularis yezoensis</i>	bee type		1	1		1	1
<i>Phyllodoce aleutica</i>	bee type	1	1	1	1	1	1
<i>Phyllodoce alpina</i>	bee type			1			
<i>Phyllodoce nipponica</i>	bee type		1	1		1	1
<i>Rhododendron aureum</i>	bee type	1			1		
<i>Rubus vernus</i>	bee type		1			1	
<i>Saussurea nikoensis</i>	bee type			1			1
<i>Schizocodon soldanelloides</i>	bee type	1	1	1	1	1	
<i>Vaccinium ovalifolium</i>	bee type		1		1	1	
<i>Vaccinium vitis idaea</i>	bee type		1			1	
<i>Anaphalis alpicola</i>	fly type		1		1	1	
<i>Anaphalis margaritacea</i>	fly type						1
<i>Anemone narcissiflora</i>	fly type	1	1	1	1	1	
<i>Arnica unalaschcensis</i> var. <i>tschonoskyi</i>	fly type			1		1	1
<i>Conioselinum filicinum</i>	fly type			1			1
<i>Coptis trifolia</i>	fly type		1			1	
<i>Cornus canadensis</i>	fly type			1		1	1
<i>Geum calthifolium</i>	fly type		1	1	1	1	1
<i>Heloniopsis orientalis</i>	fly type		1		1		
<i>Heracleum lanatum</i>	fly type			1		1	1
<i>Ixeris dentata</i> var. <i>albiflora</i> f. <i>amplifolia</i>	fly type			1			1
<i>Ligularia fischeri</i>	fly type					1	
<i>Minuartia arctica</i>	fly type		1	1		1	1
<i>Nephrophyllidium crista</i>	fly type		1	1			1
<i>Persicaria vivipara</i>	fly type		1	1		1	
<i>Persicaria weyrichii</i>	fly type		1	1		1	1
<i>Peucedanum multivittatum</i>	fly type		1	1		1	1
<i>Potentilla matsumurae</i>	fly type	1	1	1	1	1	1
<i>Ranunculus acris</i>	fly type			1	1	1	1
<i>Solidago virgaurea</i> subsp. <i>leiocarpa</i>	fly type			1		1	1
<i>Stellaria nipponica</i>	fly type		1	1		1	1
<i>Taraxacum alpicola</i>	fly type		1			1	
<i>Tilingia ajanense</i>	fly type		1	1			1
<i>Trautvetteria carolinensis</i>	fly type			1			1
<i>Trollius japonicus</i>	fly type	1	1	1	1	1	
<i>Veratrum album</i>	fly type						1
<i>Veratrum stamineum</i>	fly type					1	
<i>Veronica nipponica</i>	fly type		1		1	1	1
<i>Geranium yesoense</i>	mixed type		1	1		1	1
<i>Geum pentapetalum</i>	mixed type			1		1	1
<i>Loiseleuria procumbens</i>	mixed type	1	1		1		
<i>Picris hieracioides</i> subsp. <i>kamtschatica</i>	mixed type			1			1
<i>Arabidopsis lyrata</i>	unknown				1		
<i>Artemisia sinanensis</i>	unknown			1			
<i>Boykinia lycoctonifolia</i>	unknown		1	1		1	
<i>Cardamine nipponica</i>	unknown			1			
<i>Coptis trifoliolata</i>	unknown	1	1		1	1	
<i>Dactylorhiza aristata</i>	unknown		1				
<i>Fritillaria camschatcensis</i>	unknown		1			1	
<i>Gagea serotina</i>	unknown	1			1		
<i>Hieracium japonicum</i>	unknown			1			1
<i>Ligusticum tachiroei</i>	unknown			1			1
<i>Lilium medeoloides</i>	unknown			1			
<i>Potentilla fragarioides</i>	unknown				1	1	
<i>Saxifraga fortunei</i>	unknown			1			1
<i>Veronica schmidtiana</i>	unknown					1	
<i>Viola biflora</i>	unknown	1	1		1	1	
<i>Viola crassa</i>	unknown		1				

Table S1e Flowering record and visitor type of individual species at Taisetsu site in northern Japan.

Plant species	Visitor type	2012			2013			2014		
		Early	Middle	Late	Early	Middle	Late	Early	Middle	Late
<i>Arctica nana</i>	bee type	1	1		1	1		1	1	
<i>Arctous alpinus</i>	bee type	1			1			1		
<i>Campanula chamissonis</i>	bee type		1			1			1	
<i>Diapensia lapponica</i>	bee type	1			1			1		
<i>Dicentra peregrina</i>	bee type	1	1			1			1	
<i>Gentiana nipponica</i>	bee type		1	1		1	1		1	1
<i>Helonias orientalis</i>	bee type	1			1			1		
<i>Macrodiervilla middendorffiana</i>	bee type		1			1	1		1	1
<i>Pedicularis chamissonis</i>	bee type		1	1		1	1		1	1
<i>Pennellianthus frutescens</i>	bee type		1			1	1		1	
<i>Phyllodoce aleutica</i>	bee type		1	1		1	1		1	1
<i>Phyllodoce caerulea</i>	bee type	1			1			1		
<i>Phyllodoce caerulea</i> var. <i>yezoensis</i>	bee type		1	1		1	1	1	1	1
<i>Primula cuneifolia</i> var. <i>cuneifolia</i>	bee type	1	1	1		1	1	1	1	1
<i>Rhododendron aureum</i>	bee type	1	1		1	1	1	1	1	1
<i>Saussurea riederi</i> subsp. <i>yezoensis</i>	bee type			1			1			1
<i>Saussurea yanagisawae</i>	bee type		1	1		1	1		1	1
<i>Therorhodon camtschaticum</i>	bee type		1			1			1	
<i>Vaccinium ovalifolium</i>	bee type	1	1		1	1	1	1	1	
<i>Vaccinium uliginosum</i>	bee type	1	1		1			1		
<i>Vaccinium vitis-idaea</i>	bee type	1	1		1	1		1	1	
<i>Anemone narcissiflora</i> var. <i>sachalinensis</i>	fly type	1	1		1	1		1	1	
<i>Anemone soysensis</i>	fly type	1			1			1		
<i>Arnica unalaschcensis</i>	fly type		1	1		1	1		1	1
<i>Artemisia arctica</i>	fly type		1			1			1	
<i>Bistorta vivipara</i>	fly type		1			1			1	
<i>Bupleurum triradiatum</i>	fly type		1			1			1	
<i>Coptis trifolia</i>	fly type	1	1			1		1	1	
<i>Cornus canadensis</i>	fly type	1	1			1		1	1	
<i>Nephrophyllidium crista-galli</i>	fly type			1			1			1
<i>Parnassia palustris</i>	fly type			1			1			1
<i>Patrinia sibirica</i>	fly type	1	1			1		1	1	
<i>Peucedanum multivittatum</i>	fly type		1	1		1	1		1	1
<i>Platanthera chorisiana</i>	fly type		1						1	
<i>Potentilla matsumurae</i>	fly type	1	1	1	1	1	1	1	1	1
<i>Rhododendron diversipilosum</i>	fly type	1	1		1	1		1	1	
<i>Rhododendron subarcticum</i>	fly type	1			1			1		
<i>Solidago virgaurea</i> subsp. <i>leiocarpa</i>	fly type		1	1		1	1		1	1
<i>Sorbus matsumurana</i>	fly type				1			1		
<i>Spiraea betulifolia</i> var. <i>aemiliana</i>	fly type		1			1			1	
<i>Tephrosia kawakamii</i>	fly type		1			1			1	
<i>Tilingia ajanensis</i>	fly type		1	1		1	1		1	1
<i>Tofieldia okuboi</i>	fly type		1							
<i>Trientalis europaea</i>	fly type		1			1			1	
<i>Platanthera tipuloides</i>	moth type		1						1	
<i>Bryanthus gmelinii</i>	mixed type		1	1		1	1		1	
<i>Geranium erianthum</i>	mixed type			1			1			1
<i>Geum pentapetalum</i>	mixed type	1	1	1	1	1	1	1	1	1
<i>Harrimanella stelleriana</i>	mixed type		1	1		1	1		1	1
<i>Loiseleuria procumbens</i>	mixed type	1			1			1		
<i>Sanguisorba canadensis</i> subsp. <i>latifolia</i>	mixed type			1			1			1
<i>Spiraea betulifolia</i>	mixed type		1	1		1			1	1
<i>Veronica stelleri</i> var. <i>longistyla</i>	mixed type		1	1		1	1		1	1
<i>Viola alliariaefolia</i>	mixed type	1			1			1		
<i>Cassiope lycopodioides</i>	unknown								1	
<i>Hemerocallis middendorffii</i>	unknown		1			1			1	
<i>Linnaea borealis</i>	unknown		1			1			1	

Table S1f Flowering record and visitor type of individual species at Hustai site in Mongolia.

Plant species	Visitor type	2015			2016		
		Early	Middle	Late	Early	Middle	Late
<i>Aconitum barbatum</i>	bee type	0	1	1	0	0	1
<i>Allium leucocephalum</i>	bee type	0	1	1	0	0	1
<i>Alyssum obovatum</i>	bee type	1	0	0	1	1	0
<i>Amblynotus rupestris</i>	bee type	1	1	1	1	1	0
<i>Arctogeron gramineum</i>	bee type	1	0	0	1	0	0
<i>Astragalus fruticosus</i>	bee type	1	0	0	1	1	0
<i>Campanula glomerata</i>	bee type	0	1	1	0	0	1
<i>Caryopteris mongholica</i>	bee type	0	0	1	0	0	1
<i>Chamaerhodos altaica</i>	bee type	1	0	0	1	1	0
<i>Cicuta virosa</i>	bee type	0	0	1			
<i>Cirsium esculentum</i>	bee type	0	0	1	0	0	1
<i>Euphrasia pectinata</i>	bee type	0	0	1	0	0	1
<i>Geranium pseudosibiricum</i>	bee type	0	0	1	0	1	0
<i>Iris lactea</i>	bee type	1	0	0	1	1	0
<i>Iris tigridia</i>	bee type	1	0	0	1	0	0
<i>Linaria vulgaris</i> subsp. <i>acutiloba</i>	bee type	0	1	1	0	1	1
<i>Lophanthus chinensis</i>	bee type	0	1	1	1	1	1
<i>Orostachys spinosa</i>	bee type	0	1	1	0	1	1
<i>Papaver nudicaule</i>	bee type	1	1	1	1	1	0
<i>Patrinia rupestris</i>	bee type	0	1	1	0	1	1
<i>Phlomis tuberosa</i>	bee type	0	1	1	0	1	1
<i>Potentilla longifolia</i>	bee type	0	1	1	0	0	1
<i>Prunus pedunculata</i>	bee type	1	0	0	1	0	0
<i>Pulsatilla turczaninowii</i>	bee type	1	0	1	1	1	0
<i>Scutellaria scordifolia</i>	bee type	0	1	1	0	1	1
<i>Spiraea aquilegifolia</i>	bee type	1	0	1	1	0	0
<i>Spiraea media</i>	bee type				1	0	0
<i>Stellaria brachypetala</i>	bee type	1	1	0	1	0	0
<i>Trifolium lupinaster</i>	bee type	0	1	1	0	1	1
<i>Vicia cracca</i>	bee type	0	1	1	0	1	1
<i>Allium ramosum</i>	fly type	0	1	1	0	0	1
<i>Androsace incana</i>	fly type	1	0	0	1	0	1
<i>Argentina anserina</i>	fly type	1	1	1	1	1	0
<i>Bupleurum bicaule</i>	fly type	0	1	1	0	1	1
<i>Bupleurum scorzonifolium</i>	fly type	0	1	1	0	1	1
<i>Carum buriaticum</i>	fly type	0	0	1	0	0	1
<i>Carum carvi</i>	fly type	0	1	1	0	1	1
<i>Cerastium arvense</i>	fly type	0	1	0	1	1	0
<i>Chrysanthemum zawadskii</i>	fly type	0	0	1	0	0	1
<i>Heteropappus biennis</i>	fly type	0	1	1	0	1	1
<i>Heteropappus hispidus</i>	fly type				0	0	1
<i>Leontopodium ochroleucum</i>	fly type	0	1	1	0	1	1
<i>Myosotis laxa</i> subsp. <i>caespitosa</i>	fly type	1	1	0	1	1	0
<i>Myosotis sylvatica</i>	fly type	1	1	1	0	1	1
<i>Parnassia palustris</i>	fly type	0	1	1	0	0	1
<i>Ranunculus japonicus</i>	fly type	1	1	1	1	1	1
<i>Rheum rhabarbarum</i>	fly type				1	1	0
<i>Sanguisorba officinalis</i>	fly type	0	1	1	0	1	1
<i>Dianthus versicolor</i>	butterfly type	0	1	1	0	0	1
<i>Galium boreale</i>	butterfly type	0	1	1	0	1	1
<i>Lilium pumilum</i>	butterfly type	0	1	1	0	1	0
<i>Lomelosia comosa</i>	butterfly type	0	1	1	0	0	1
<i>Nepeta multifida</i>	butterfly type	0	1	1	0	1	1
<i>Saussurea amara</i>	butterfly type	0	0	1	0	0	1
<i>Saussurea salicifolia</i>	butterfly type	0	0	1	0	0	1
<i>Sedum aizoon</i>	butterfly type	0	1	1	0	1	1
<i>Silene jensenseensis</i>	butterfly type	0	1	1	0	1	1
<i>Thymus gobicus</i>	butterfly type	0	1	1	0	1	1
<i>Valeriana officinalis</i>	butterfly type	0	1	1	0	1	0
<i>Veronica incana</i>	butterfly type	0	1	1	0	1	1
<i>Vicia amoena</i>	butterfly type	0	1	1	0	1	0
<i>Astragalus mongholicus</i>	beetle type	0	1	0	0	1	0
<i>Rhaponticum uniflorum</i>	beetle type	0	1	0	0	1	0
<i>Stellera chamaejasme</i>	beetle type	1	1	1	1	1	0
<i>Achillea asiatica</i>	mixed type	0	0	1	0	1	0
<i>Allium bidentatum</i>	mixed type	0	1	1	0	1	1
<i>Alyssum canescens</i>	mixed type	0	1	1	0	1	1
<i>Aster alpinus</i>	mixed type	0	1	1	0	1	1
<i>Clausia aprica</i>	mixed type	1	0	1	1	1	0

<i>Convolvulus ammannii</i>	mixed type	0	0	1	0	1	0
<i>Crepidiasrum tenuifolium</i>	mixed type	0	1	1	0	0	1
<i>Cruciata glabra</i>	mixed type	0	1	1	0	1	1
<i>Dasiphora fruticosa</i>	mixed type	0	1	1	0	1	1
<i>Dontostemon integrifolius</i>	mixed type	0	0	1	1	1	1
<i>Epilobium angustifolium</i>	mixed type	0	1	1	0	0	1
<i>Eremogone capillaris</i>	mixed type	0	1	1	0	1	1
<i>Euphorbia esula</i>	mixed type	1	1	0	1	1	0
<i>Filifolium sibiricum</i>	mixed type	0	1	1	0	1	1
<i>Gentiana alba</i>	mixed type	0	1	0			
<i>Geranium sibiricum</i>	mixed type	0	1	1	0	1	1
<i>Goniolimon speciosum</i>	mixed type	0	1	1	0	1	1
<i>Halenia corniculata</i>	mixed type	0	0	1			
<i>Inula britannica</i>	mixed type	0	1	1	0	1	1
<i>Noccaea cochleariforme</i>	mixed type	1	0	1	1	0	0
<i>Potentilla cinerea</i>	mixed type	1	0	0	1	0	0
<i>Potentilla sericea</i>	mixed type	1	1	1	1	1	0
<i>Primula farinosa</i>	mixed type	1	0	0	1	1	0
<i>Rosa acicularis</i>	mixed type	0	1	0	0	1	0
<i>Scorzonera austriaca</i>	mixed type	1	1	0	1	1	0
<i>Serratula centauroides</i>	mixed type	0	1	1	0	1	1
<i>Sibbaldianthe bifurca</i>	mixed type	1	1	1	1	1	0
<i>Stellaria dichotoma</i>	mixed type	1	1	1	1	1	0
<i>Taraxacum collinum</i>	mixed type	0	0	1	1	1	1
<i>Veronica longifolia</i>	mixed type	0	0	1	0	0	1
<i>Vicia multicaulis</i>	mixed type	0	1	1			
<i>Achillea alpina</i>	unknown	0	1	1	0	1	1
<i>Adenophora stenanthina</i>	unknown	0	0	1	0	0	1
<i>Agrimonia pilosa</i>	unknown	0	1	1	0	0	1
<i>Allium schoenoprasum</i>	unknown	0	1	0			
<i>Allium senescens</i>	unknown	0	1	0	0	0	1
<i>Allium tenuissimum</i>	unknown	0	1	1	0	1	1
<i>Alyssum lenense</i>	unknown	0	0	1			
<i>Androsace maxima</i>	unknown				1	1	0
<i>Androsace septentrionalis</i>	unknown				1	1	0
<i>Anemone sylvestris</i>	unknown				0	1	0
<i>Aquilegia viridiflora</i>	unknown	0	1	0	1	0	0
<i>Astragalus dahuricus</i>	unknown				0	1	0
<i>Astragalus galactites</i>	unknown	1	0	0	1	0	0
<i>Astragalus tenuis</i>	unknown				0	0	1
<i>Caragana leucophloea</i>	unknown	0	1	1	0	1	0
<i>Caragana microphylla</i>	unknown	1	0	1	1	1	0
<i>Caragana pygmaea</i>	unknown	0	1	1	0	1	0
<i>Chamaerhodos erecta</i>	unknown	0	0	1	0	1	1
<i>Chelidonium majus</i>	unknown	0	0	1			
<i>Chenopodium album</i>	unknown				0	0	1
<i>Clematis sibirica</i>	unknown				1	0	0
<i>Cotoneaster melanocarpus</i>	unknown	0	1	1	0	1	0
<i>Cotoneaster mongolicus</i>	unknown				1	1	0
<i>Crataegus sanguinea</i>	unknown				1	0	0
<i>Cymbaria daurica</i>	unknown	0	1	1	0	1	0
<i>Dactylorhiza salina</i>	unknown				0	1	0
<i>Delphinium grandiflorum</i>	unknown	0	0	1	0	0	1
<i>Delphinium triste</i>	unknown	0	1	1	0	1	1
<i>Descurainia sophia</i>	unknown	0	0	1	0	1	0
<i>Dianthus superbus</i>	unknown				0	0	1
<i>Draba nemorosa</i>	unknown				1	1	0
<i>Dracocephalum foetidum</i>	unknown	0	1	0			
<i>Dracocephalum origanoides</i>	unknown				0	1	0
<i>Dracocephalum ruyschiana</i>	unknown	0	1	0	0	1	1
<i>Ephedra sinica</i>	unknown				1	1	0
<i>Epilobium palustre</i>	unknown	0	0	1	0	0	1
<i>Erigeron acer</i>	unknown	0	1	0			
<i>Erodium stephanianum</i>	unknown	0	0	1	0	1	1
<i>Erysimum cheiranthoides</i>	unknown	0	0	1			
<i>Erysimum cuspidatum</i>	unknown				1	1	1
<i>Erysimum flavum</i>	unknown	0	1	1	1	1	1
<i>Ferulopsis hystrix</i>	unknown	1	1	1	1	1	0
<i>Galatella dahurica</i>	unknown	0	1	1	0	0	1
<i>Gentiana decumbens</i>	unknown	0	1	1	0	0	1
<i>Gentiana squarrosa</i>	unknown	0	0	1	0	1	0
<i>Gentianopsis barbata</i>	unknown	0	0	1	0	0	1

<i>Geranium pratense</i>	unknown	0	1	1	0	1	1
<i>Geum aleppicum</i>	unknown	0	1	1	0	1	1
<i>Halerpestes sarmentosus</i>	unknown				0	1	0
<i>Haplophyllum dauricum</i>	unknown	0	1	1	0	1	1
<i>Heteropappus altaicus</i>	unknown	0	1	1	0	0	1
<i>Hieracium umbellatum</i>	unknown	0	0	1	0	0	1
<i>Hylotelephium telephium</i>	unknown				0	0	1
<i>Hypericum attenuatum</i>	unknown	0	1	0			
<i>Iris humilis</i>	unknown	1	0	0	1	0	0
<i>Iris ruthenica</i>	unknown				1	0	0
<i>Lappula myosotis</i>	unknown	0	1	1	0	1	0
<i>Lathyrus humilis</i>	unknown				1	1	0
<i>Lathyrus pratensis</i>	unknown	0	1	1	0	0	1
<i>Leontopodium leontopodioides</i>	unknown	0	1	0	0	1	0
<i>Leonurus deminutus</i>	unknown				0	0	1
<i>Leonurus sibiricus</i>	unknown				0	1	0
<i>Leptopyrum fumarioides</i>	unknown				1	0	0
<i>Lespedeza juncea</i>	unknown	0	0	1			
<i>Limonium flexuosum</i>	unknown	0	0	1	0	0	1
<i>Linum perenne</i>	unknown	0	1	1	0	1	0
<i>Lomatogonium rotatum</i>	unknown	0	0	1	0	0	1
<i>Lysimachia maritima</i>	unknown				0	1	0
<i>Medicago falcata</i>	unknown	0	1	1	0	1	1
<i>Medicago lupulina</i>	unknown	0	1	1			
<i>Odontites rubra</i>	unknown	0	0	1	0	0	1
<i>Orostachys malacophylla</i>	unknown	0	0	1	0	1	1
<i>Oxytropis caespitosa</i>	unknown	0	0	1	1	1	0
<i>Oxytropis glabra</i>	unknown	0	0	1	0	1	0
<i>Oxytropis lanata</i>	unknown	0	0	1			
<i>Oxytropis myriophylla</i>	unknown	0	1	0	0	1	0
<i>Oxytropis oxyphylla</i>	unknown	0	0	1	0	1	0
<i>Pedicularis flava</i>	unknown	1	0	0	1	1	0
<i>Pedicularis myriophylla</i>	unknown	0	0	1	0	1	1
<i>Pedicularis rubens</i>	unknown	1	0	1	1	0	0
<i>Pedicularis striata</i>	unknown	0	1	0	0	1	0
<i>Persicaria vivipara</i>	unknown	0	1	1	0	1	0
<i>Physochlaina physaloides</i>	unknown				1	0	0
<i>Polygala hybrida</i>	unknown	0	1	1	1	1	1
<i>Polygala tenuifolia</i>	unknown	0	1	1	1	1	0
<i>Polygonatum odoratum</i>	unknown				1	0	0
<i>Polygonum angustifolium</i>	unknown	1	1	1	1	1	0
<i>Polygonum aviculare</i>	unknown	0	0	1			
<i>Potentilla conferta</i>	unknown	1	1	1	0	1	0
<i>Potentilla multifida</i>	unknown	1	0	0	1	0	0
<i>Prunus padus</i> var. <i>asiatica</i>	unknown				1	0	0
<i>Pulsatilla bungeana</i>	unknown	0	0	1	0	1	0
<i>Pulsatilla patens</i> subsp. <i>flavescens</i>	unknown	1	0	0	1	0	0
<i>Ranunculus sceleratus</i>	unknown	0	1	0	0	0	1
<i>Ribes diacanthum</i>	unknown				1	0	0
<i>Rorippa islandica</i>	unknown	0	0	1			
<i>Rubus saxatilis</i>	unknown				0	1	0
<i>Rumex thyrsiflorus</i>	unknown				0	1	0
<i>Saxifraga bronchialis</i> subsp. <i>spinulosa</i>	unknown	1	1	1	1	1	0
<i>Saxifraga sibirica</i>	unknown	0	0	1	1	1	0
<i>Senecio campester</i>	unknown	0	0	1			
<i>Sibbaldianthe adpressa</i>	unknown	1	0	0	1	0	0
<i>Silene linnaeana</i>	unknown	0	0	1	0	1	0
<i>Silene repens</i>	unknown				0	0	1
<i>Spiranthes sinensis</i>	unknown				0	1	0
<i>Stellaria crassifolia</i>	unknown	0	1	0	0	1	0
<i>Taraxacum bornuurensse</i>	unknown	1	1	0	1	1	0
<i>Taraxacum ceratophorum</i>	unknown	1	0	0			
<i>Taraxacum dissectum</i>	unknown	1	0	0			
<i>Thalictrum foetidum</i>	unknown	0	1	0	0	1	0
<i>Thalictrum petaloideum</i>	unknown	1	1	0	1	1	0
<i>Thalictrum simplex</i>	unknown	0	1	0	0	1	0
<i>Thermopsis lanceolata</i>	unknown	1	0	0	1	1	0
<i>Tragopogon trachycarpus</i>	unknown	0	0	1	0	0	1
<i>Veronica anagallis-aquatica</i>	unknown	0	0	1			
<i>Vicia unijuga</i>	unknown	1	1	0			
<i>Vincetoxicum purpureum</i>	unknown				0	1	0
<i>Viola dissecta</i>	unknown	1	0	0	1	0	0

Table S2. The number of species flowered and the proportion of flowering species in each season of survey years across sites.

Site	Year	No. flowering sp.			Prop. flowering species		
		Early	Middle	Late	Early	Middle	Late
NZ_Oldman	2011	23	27	22	0.47	0.55	0.45
	2012	28	45	48	0.43	0.69	0.74
	2013	47	52	36	0.74	0.77	0.53
	mean	32.7	41.3	35.3	0.55	0.67	0.57
NZ_Remarks	2011	23	29	26	0.43	0.55	0.49
	2012	24	54	49	0.39	0.87	0.79
	2013	38	47	46	0.57	0.70	0.69
	mean	28.3	43.3	40.3	0.46	0.71	0.66
TW_Hehuan	2017	48	88	62	0.38	0.70	0.50
	2018	62	82	60	0.55	0.73	0.54
	mean	55.0	85.0	61.0	0.47	0.72	0.52
CJ_Tateyama	2012	13	35	47	0.22	0.58	0.78
	2013	21	38	40	0.31	0.57	0.60
	mean	17.0	36.5	43.5	0.27	0.58	0.69
NJ_Taisetsu	2012	17	39	20	0.33	0.75	0.38
	2013	16	40	21	0.31	0.77	0.40
	2014	19	41	19	0.35	0.75	0.35
	mean	17.3	40.0	20.0	0.33	0.76	0.38
MG_Hustai	2015	46	107	134	0.26	0.59	0.74
	2016	68	126	93	0.35	0.65	0.48
	mean	57.0	116.5	113.5	0.31	0.62	0.61

Table S3. GLMM result of flower abundance variations at each site. Explanatory variables of the NZ sites are season (early, middle, late) and site (Oldman, Remarks). Explanatory variables of other sites are season (early, middle, late) and visitor type (bee type, fly type).

(a) GLMM for New Zealand sites (NZ_Oldman, NZ_Remarks)

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Oldman site)	1.12	0.17	6.68	<0.0001 ***
Middle season	-0.05	0.22	-0.23	0.82
Late season	-0.21	0.22	-0.98	0.33
Remarks site	-0.51	0.23	-2.26	0.024 *
Middle $\times$ Remarks	0.29	0.32	0.93	0.35
Late $\times$ Remarks	0.63	0.31	2.02	0.044 *

(b) GLMM for Taiwan site (TW_Hehuan)

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Bee type)	2.15	0.77	2.79	0.005 **
Middle season	-0.02	0.86	-0.02	0.98
Late season	-0.59	0.88	-0.67	0.50
Fly type	-0.42	0.85	-0.49	0.62
Middle $\times$ Fly type	0.44	0.98	0.45	0.65
Late $\times$ Fly type	1.28	1.00	1.28	0.20

(c) GLMM for Central Japan site (CJ_Tateyama)

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Bee type)	1.54	1.24	1.25	0.21
Middle season	1.41	1.46	0.97	0.34
Late season	2.88	1.41	2.04	0.042 *
Fly type	0.41	1.72	0.24	0.81
Middle $\times$ Fly type	-1.25	1.94	-0.64	0.52
Late $\times$ Fly type	0.90	1.93	0.47	0.64

(d) GLMM for Northern Japan site (NJ_Taisetsu)

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Bee type)	8.13	1.11	7.32	<0.0001 ***
Middle season	-4.23	1.27	-3.34	<0.001 ***
Late season	-3.03	1.53	-1.99	0.047 *
Fly type	-3.50	1.93	-1.82	0.069 +
Middle $\times$ Fly type	2.76	2.13	1.30	0.20
Late $\times$ Fly type	6.36	2.42	2.62	0.009 **

(e) GLMM for Mongolian site (MG_Hustai)

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Bee type)	4.38	0.63	7.01	<0.0001 ***
Middle season	-2.15	0.84	-2.57	0.010 *
Late season	-2.41	0.86	-2.80	0.0051 **
Fly type	-0.42	1.39	-0.30	0.76
Middle $\times$ Fly type	-0.10	1.63	-0.06	0.95
Late $\times$ Fly type	3.18	1.62	1.97	0.049 *

Table S4. GLMM results of the frequencies of major flower visitors at each site. In the NZ region having two sites, season, site, and ambient temperature during the observation period are included as explanatory variables. For other regions, season and ambient temperature are included as explanatory variables.

(a) New Zealand (NZ_Oldman, NZ_Remarks)

Syrphid fly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Oldman site)	-4.02	0.29	-14.0	<0.0001 ***
Middle season	-0.21	0.14	-1.55	0.12
Late season	0.34	0.10	3.47	<0.001 ***
Remarks site	1.72	0.10	17.4	<0.0001 ***
Ambient Temp	0.12	0.01	16.5	<0.0001 ***
Middle × Remarks	-0.71	0.16	-4.53	<0.0001 ***
Late × Remarks	-1.92	0.14	-13.8	<0.0001 ***

Non-syrphid fly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Oldman site)	-1.77	0.41	-4.30	<0.0001 ***
Middle season	0.19	0.22	0.84	0.40
Late season	0.04	0.21	0.20	0.84
Remarks site	-1.68	0.31	-5.50	<0.0001 ***
Ambient Temp	0.05	0.02	3.43	<0.001 ***
Middle × Remarks	1.25	0.36	3.47	<0.001 ***
Late × Remarks	2.64	0.36	7.25	<0.0001 ***

Beetle model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season, Oldman site)	-2.43	0.92	-2.65	0.008 **
Middle season	0.12	0.59	0.21	0.83
Late season	-0.99	0.49	-2.01	0.045 *
Remarks site	-0.92	0.66	-1.40	0.16
Ambient Temp	0.004	0.036	0.10	0.92
Middle × Remarks	2.47	0.87	2.85	0.004 **
Late × Remarks	-0.67	0.97	-0.68	0.49

(b) Taiwan (TW_Hehuan)

Syrphid fly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	2.59	0.56	4.61	<0.0001 ***
Middle season	0.29	0.19	1.49	0.14
Late season	-0.025	0.171	-0.15	0.88
Ambient Temp	0.001	0.027	0.05	0.96

Non-syrphid fly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	1.86	0.10	18.5	<0.0001 ***
Middle season	-0.72	0.05	-15.7	<0.0001 ***
Late season	0.48	0.03	15.1	<0.0001 ***
Ambient Temp	0.08	0.01	15.9	<0.0001 ***

Bumble bee model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	1.44	0.70	2.06	0.039 *
Middle season	1.24	0.23	5.50	<0.0001 ***
Late season	1.26	0.22	5.86	<0.0001 ***
Ambient Temp	0.02	0.03	0.64	0.53

(c) Central Japan (CJ_Tateyama)**Syrphid fly model**

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	-0.91	0.82	-1.10	0.27
Middle season	0.15	0.48	0.30	0.76
Late season	-0.27	0.49	-0.55	0.59
Ambient Temp	-0.01	0.03	-0.40	0.69

Non-syrphid fly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	-5.62	0.90	-6.23	<0.0001 ***
Middle season	3.06	0.64	4.80	<0.0001 ***
Late season	2.25	0.65	3.45	<0.001 ***
Ambient Temp	0.10	0.03	3.35	<0.001 ***

Bumble bee model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	-4.75	0.93	-5.06	<0.0001 ***
Middle season	2.23	0.74	3.04	0.0024 **
Late season	2.89	0.73	3.96	<0.0001 ***
Ambient Temp	0.04	0.03	1.32	0.19

(d) Northern Japan (NJ_Taisetsu)**Syrphid fly model**

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	-0.20	0.80	-0.25	0.80
Middle season	2.73	0.31	8.81	<0.0001 ***
Late season	3.03	0.37	8.23	<0.0001 ***
Ambient Temp	0.04	0.03	1.24	0.22

Non-syrphid fly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	1.77	0.46	3.87	<0.001 ***
Middle season	0.14	0.21	0.64	0.52
Late season	2.19	0.26	8.44	<0.0001 ***
Ambient Temp	0.01	0.02	0.62	0.53

Bumble bee model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	-0.57	0.59	-0.96	0.34
Middle season	1.60	0.26	6.11	<0.0001 ***
Late season	2.99	0.31	9.71	<0.0001 ***
Ambient Temp	0.04	0.02	1.93	0.053+

(e) Mongolia (MG_Hustai)**Non-syrphid fly model**

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	2.25	0.52	4.29	<0.0001 ***
Middle season	-0.02	0.30	-0.05	0.96
Late season	1.46	0.28	5.25	<0.0001 ***
Ambient Temp	-0.05	0.02	-2.59	0.0096 **

Solitary bee model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	3.87	0.66	5.84	<0.0001 ***
Middle season	-1.72	0.37	-4.69	<0.0001 ***
Late season	-1.49	0.28	-5.38	<0.0001 ***
Ambient Temp	-0.05	0.02	-2.38	0.017 *

Butterfly model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	-1.67	0.63	-2.65	0.008 **
Middle season	3.78	0.60	6.33	<0.0001 ***
Late season	5.35	0.59	9.07	<0.0001 ***
Ambient Temp	-0.05	0.01	-6.08	<0.0001 ***

Beetle model

Variable	Coeffi.	SE	z value	P value
Intercept (Early season)	0.48	0.19	2.56	0.010 *
Middle season	1.31	0.12	10.8	<0.0001 ***
Late season	-0.38	0.24	-1.60	0.11
Ambient Temp	0.03	0.01	3.46	<0.001 ***