



A Review of Host and Nectar Plants of Endangered Butterflies in South Korea

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ABSTRACT

Butterflies are insects that consistently attract significant attention due to their beautiful appearance. In this review, we analyzed the feeding preferences of endangered butterfly larval host plants and adult nectar plants. We examined host and nectar plants of all Korean endangered butterfly species by referring to previous literature. Each endangered butterfly species in this review exhibited a narrow range of feeding preferences, utilizing between 0 to 3 plant families and 0 to 14 plant species as host plants. Both *Aporia crataegi* and *Melitaea ambigua* had the highest number of host plant families ($n = 3$), and *A. crataegi* had the highest number of host plant species ($n = 14$). In total, 13 families and 42 species of host plants were identified as being utilized by 14 target endangered butterfly species. Conversely, each endangered butterfly species in this review demonstrated a broad range of feeding preferences, utilizing between 2 to 12 plant families and 2 to 21 plant species as nectar plants. *M. ambigua* had the highest number of nectar plant families ($n = 12$) and the highest number of nectar plant species ($n = 21$). In total, 21 families and 61 species of nectar plants were identified as being utilized by 14 target endangered butterfly species. This review is the first to comprehensively summarize the host and nectar plants of all endangered butterflies in South Korea and could serve to establish future restoration plans for these butterflies.

Keywords: Butterfly, Endangered species, Feeding preference, Food, Habitat restoration

Introduction


The Korean peninsula borders Russia in the northeast and China in the northwest, while facing Japan across the Strait of Korea to the southeast. It features numerous mountain ranges and exhibits a relatively high diversity

of species (Shin, 2002). The International Union for Conservation of Nature (IUCN) produces the Red List, which serves as the most comprehensive global source of information on the extinction risk status of animal, fungal, and plant species, supporting the development, prioritization, and monitoring of conservation policies for threatened species worldwide (Warren *et al.*, 2007; Mace *et al.*, 2008; Fox *et al.*, 2011). Red Lists of butterflies have been published in several countries (Warren *et al.*, 2007; IUCN, 2010; van Swaay *et al.*, 2010). In South Korea, Choi and Kim (2012) first conducted a Red List assessment of butterflies, examining the current state of endangered butterflies. The Korean government has designated a total of 10 butterfly species as endangered ($n = 4$ for Class I and

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$n = 6$ for Class II) and has additionally designated four butterfly species as candidate species (National Institute of Ecology, 2023).

Butterfly species are a well-studied group of insects both taxonomically and ecologically (Robbins & Opler, 1997). Butterflies are commonly used as indicators of environmental change, habitat fragmentation, habitat use change, agricultural activities, and air pollution in ecology and conservation biology (Samways, 2005; Nakamura, 2011; Kim *et al.*, 2020). Recently, concerns have arisen about drastic changes in their distribution and abundance due to human impacts on landscapes and climate (Fox *et al.*, 2011). In Japan, the decline in butterfly populations has been linked to various human activities, such as habitat alteration, destruction and degradation, loss of specific habitats, over-exploitation, invasive species, chemical pollution, and global warming (Nakamura, 2011). In South Korea, several factors have been suggested as potential causes of butterfly decline, including habitat loss, forest succession, rising temperatures, over-exploitation, and the loss of symbiotic ants (Choi & Kim, 2012). Butterflies, as phytophagous arthropods, depend heavily on host plant attributes, which play a crucial role in butterfly status due to their influence on insect life-history traits (Price, 2002; Hunter, 2003). Butterflies rely on host plants or other food sources during two distinct life stages. The feeding of adults and larvae influences life history traits, impacting maintenance, development, reproduction, and especially lifespan and offspring number (Vane-Wright & Ackery, 1984). Larval host plants are considered a critical resource for defining metapopulation patchworks among butterflies (Thomas & Hanski, 1997; Ehrlich & Hanski, 2004). Recently, the importance of a broader range of resources for such definitions has garnered attention (Dennis *et al.*, 2003, 2006, 2007; Shreeve *et al.*, 2004). Nectar is also vital for defining habitat patches for butterflies and diurnal moths (Murphy *et al.*, 1983; Tudor *et al.*, 2004; Binzenhofer *et al.*, 2005). High concentrations of butterflies on nectar sources have been well-documented across various landscapes (Brakefield, 1982; Dover, 1996; Freese *et al.*, 2006; Jantunen & Saarnio, 2005; Croxton *et al.*, 2005). Nectar also plays a significant role in pollinating flowering plants (Wiklund *et al.*, 1982; Faegri & van der Pijl, 1979; Proctor *et al.*, 1996). Despite this significance of host and nectar plants for the conservation of endangered butterflies, comprehensive studies on such plants have been seldom conducted across the endangered butterfly species at a national scale in South Korea (Kim *et al.*, 2012).

The goal of this study is to review the host and nectar plants of endangered butterflies in South Korea. We began by gathering information on the host and nectar plants of all Korean endangered butterfly species from prior studies. Subsequently, we analyzed the feeding preferences for

larval host plants and adult nectar plants of each endangered butterfly species.

Endangered Butterflies in South Korea

There are 10 endangered butterfly species ($n = 4$ and 6 for Class I and Class II, respectively) in South Korea. Among these, four endangered species of Class I are *Parnassius bremeri*, *Hipparchia autonoe*, *Aporia crataegi*, and *Sinia divina*, while six species of endangered Class II include *Protantigius superans*, *Cigaritis takanonis*, *Mellicta ambigua*, *Argynnis nerippe*, *Leptalina unicolor*, and *Chalinga pratti*. Both classes are protected domestically by the Ministry of Environment in South Korea. Additionally, there are four candidate endangered species in South Korea, namely *Phengaris kurentzovi*, *Phengaris teleius*, *Plebejus subsolanus*, and *Melitaea latefascia* (Fig. 1).

Literature Review of Host and Nectar Plants

A total of 44 previous studies were selected as references (see references without in-text citation). We examined both larval host plants and adult nectar plants for each endangered butterfly using these references (Table 1). We were able to collect information on host and nectar plant species for each butterfly, except host plants for *C. takanonis*. The larvae of *C. takanonis* are known to utilize food provided by an ant species (*Crematogaster matsumurai*) or food stored in ant nests, but specific host plants remain unidentified. Moreover, we gathered information on *P. kurentzovi* and *P. teleius* which feed on eggs and larvae of ants (*Myrmica* sp.; *Myrmica skotokui* and *Myrmica ruginodis*, respectively) as parasitic butterflies of ants, along with their host plants.

Larval Host Plants

Each endangered butterfly species exhibited a narrow range of feeding preferences on host plant families (0–3) and species (0–14) in this study (Table 1). Both *A. crataegi* and *M. ambigua* had the highest number of host plant families ($n = 3$), while other species had fewer than two families. Furthermore, *A. crataegi* had the most species of host plants ($n = 14$), but other species had fewer than eight species.

In this review, 13 families and 42 species of plants were identified as utilized by 14 endangered butterflies (Table 2). Among these, the Rosaceae was the most common host plant family, supporting three butterfly species (*A. crataegi*, *P. kurentzovi*, and *P. teleius*). The remaining 12 families were used by one or two butterfly species. Of the 42 host plant species, three were predominantly utilized by the butterflies. Undulate speedwell (*Veronica undulata*), Asian plantain (*Plantago asiatica*), and Asian siphonostegia (*Siphonostegia chinensis*) supported two butterfly species (*M. ambigua* and *M. latefascia*). Additionally, Great burnet (*Sanguisorba*

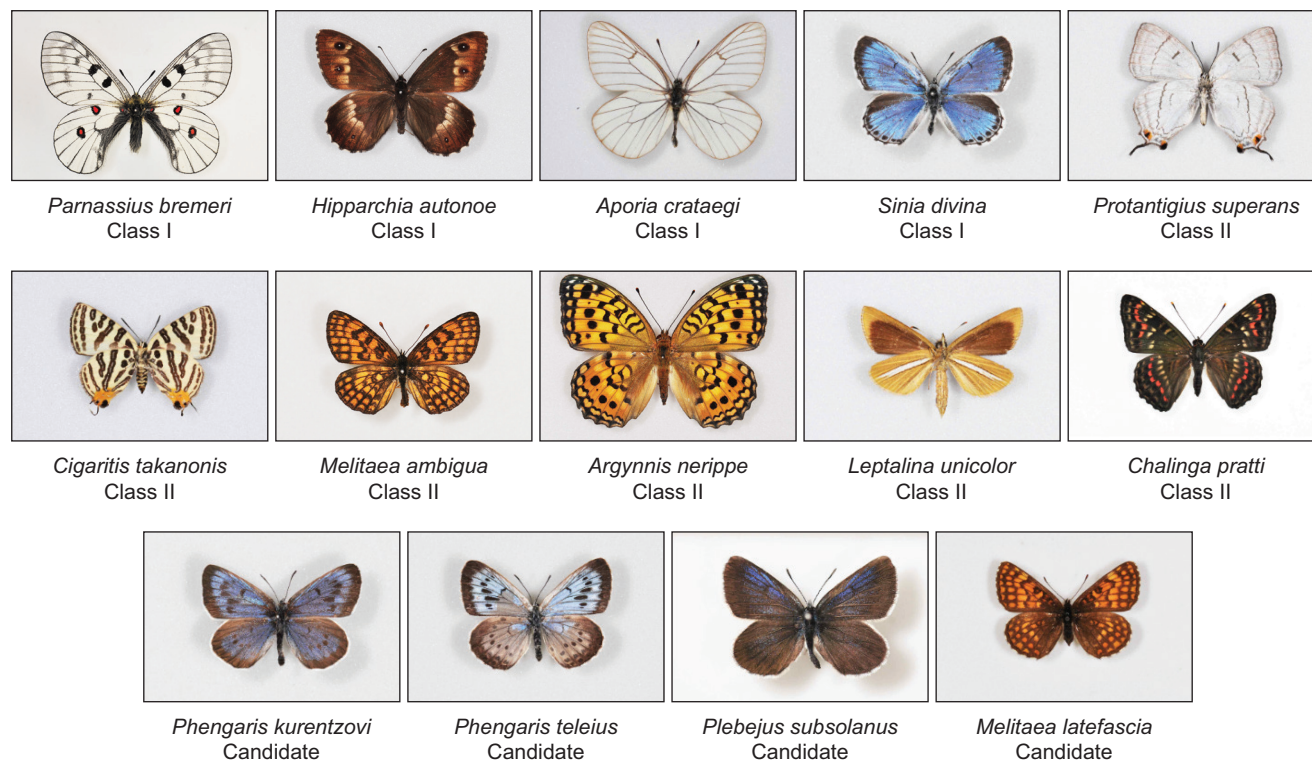


Fig. 1. Butterfly species designated as endangered and domestically protected in South Korea.

officinalis) and English walnut (*Juglans regia*) each supported two butterfly species (*P. kurentzovi* and *P. teleius*; *A. crataegi* and *P. superans*, respectively). The other host plant species were utilized by only one butterfly species.

Adult Nectar Plants

The endangered butterfly species exhibited a wide range of feeding preferences, consuming nectar from between two and twelve plant families and from two to twenty-one plant species (Table 1). *M. ambigua* utilized the maximum number of nectar plant families ($n = 12$), significantly more than other butterfly species which utilized fewer than eight families. Similarly, *M. ambigua* was found to feed on the highest number of nectar plant species ($n = 21$), followed by *A. nerippe* ($n = 16$) and *M. latefascia* ($n = 11$), with other species feeding on fewer than eight species.

This review found that 21 families and 61 species of nectar plants are used by 14 endangered butterfly species (Table 2). Of these families, Asteraceae is most frequently utilized by butterfly species ($n = 13$), followed by Fabaceae ($n = 10$), Rosaceae ($n = 7$), Primulaceae ($n = 5$), Lamiaceae ($n = 4$), Valerianaceae ($n = 4$), Hydrangeaceae ($n = 4$), Scrophulariaceae ($n = 3$), Dipsacaceae ($n = 3$), Crassulaceae ($n = 2$), Brassicaceae ($n = 2$), with other plants being used less frequently ($n = 1$). Among the 61 species of nectar

plants, Ussuri thistle (*Cirsium japonicum*) was the most commonly used ($n = 10$), followed by White-top (*Erigeron annuus*; $n = 8$), White dutch clover (*Trifolium repens*; $n = 6$), Gooseneck loosestrife (*Lysimachia clethroides*; $n = 5$), Common brea (*Brea segeta*; $n = 4$), Lilac self-heal (*Prunella vulgaris*; $n = 3$), and Northeastern scabious (*Scabiosa comosa*; $n = 3$). The remaining nectar plants were utilized by one or two butterfly species.

Conclusions and Recommendations

For host plants, given the host specificity exhibited by many butterfly species, it is essential to incorporate these ecological characteristics thoroughly when planning restoration programs for specific butterfly species, especially those that depend on one or two host plants for larval survival and development (e.g., *P. bremeri* feeds on one host species). For nectar plants, considering that nectar consists of glucose, fructose, and sucrose, which are crucial for the survival and reproduction of adult butterflies, the selection of nectar plants should reflect the utilization behavior of numerous butterfly species in the planning of restoration programs, particularly for species that favor a limited variety of nectar plants (e.g., *C. pratti* feeds on two nectar species). Additionally, the simultaneous consideration of both host and nectar plants is vital to achieve a successful

Table 1. Host and nectar plants of endangered butterfly species (n = 14) in South Korea

Butterfly species	Host plant		Nectar plant		
	Family	Species	Family	Species	
<i>Parnassius bremeri</i>	Crassulaceae	<i>Phedimus aizoon</i>	Crassulaceae	<i>Phedimus aizoon</i>	
			Asteraceae	<i>Cirsium japonicum</i>	
			Valerianaceae	<i>Valeriana coreana</i>	
			Fabaceae	<i>Robinia pseudoacacia</i>	
			Rosaceae	<i>Rubus idaeus</i>	
<i>Hipparchia autonoe</i>	Poaceae	<i>Festuca ovina</i>	Asteraceae	<i>Senecio nemorensis</i>	
	"	<i>Elymus tsukushiensis</i>	"	<i>Cirsium japonicum</i>	
	Cyperaceae	<i>Carex erythrobasis</i>	Lamiaceae	<i>Prunella vulgaris</i>	
	"	<i>Carex humilis</i>	"	<i>Thymus quinquecostatus</i>	
			"	<i>Clinopodium micranthum</i>	
			Dipsacaceae	<i>Scabiosa comosa</i>	
			Scrophulariaceae	<i>Pedicularis resupinata</i>	
			"	<i>Pedicularis hallaisanensis</i>	
	<i>Aporia crataegi</i>	Rosaceae	<i>Prunus serrulata</i>	Asteraceae	<i>Cirsium japonicum</i>
		"	<i>Malus pumila</i>	"	<i>Breea segeta</i>
"		<i>Pyrus pyrifolia</i>	Fabaceae	<i>Trifolium repens</i>	
"		<i>Chaenomeles speciosa</i>	"	<i>Vicia amoena</i>	
"		<i>Malus micromalus</i>	Caryophyllaceae	<i>Dianthus chinensis</i>	
"		<i>Sorbus commixta</i>			
"		<i>Rosa rugosa</i>			
"		<i>Prunus armeniaca</i>			
"		<i>Prunus mandshurica</i>			
"		<i>Malus mandshurica</i>			
"		<i>Prunus sibirica</i>			
"		<i>Crataegus pinnatifida</i>			
<i>Sinia divina</i>	Juglandaceae	<i>Juglans regia</i>			
	Betulaceae	<i>Betula pendula</i>			
	Fabaceae	<i>Sophora flavescens</i>	Asteraceae	<i>Cirsium japonicum</i>	
<i>Protantigius superans</i>	Salicaceae	<i>Populus davidiana</i>	"	<i>Erigeron annuus</i>	
			"	<i>Breea segeta</i>	
			Fabaceae	<i>Sophora flavescens</i>	
			"	<i>Trifolium repens</i>	
			Lamiaceae	<i>Prunella vulgaris</i>	
			Rosaceae	<i>Rubus</i> sp.	
			Primulaceae	<i>Lysimachia clethroides</i>	
<i>Cigaritis takanonis</i>	Juglandaceae	<i>Juglans regia</i>	"	<i>Lysimachia barystachys</i>	
	"	<i>Juglans mandshurica</i>	Fabaceae	<i>Pisum sativum</i>	
<i>Cigaritis takanonis</i>			Asteraceae	<i>Erigeron annuus</i>	
			Primulaceae	<i>Lysimachia clethroides</i>	
			Fagaceae	<i>Castanea crenata</i>	

Table 1. Continued.

Butterfly species	Host plant		Nectar plant	
	Family	Species	Family	Species
<i>Melitaea ambigua</i>	Scrophulariaceae	<i>Siphonostegia chinensis</i>	Fabaceae	<i>Trifolium repens</i>
	"	<i>Veronica undulata</i>	Brassicaceae	<i>Arabis hirsuta</i>
	"	<i>Veronicastrum sibiricum</i>	"	<i>Berteroella maximowiczii</i>
	"	<i>Melampyrum roseum</i>	"	<i>Cardamine leucantha</i>
	Asteraceae	<i>Artemisia japonica</i>	"	<i>Barbarea orthoceras</i>
	Plantaginaceae	<i>Plantago asiatica</i>	"	<i>Brassica sativus</i>
			"	<i>Brassica rapa</i>
			Onagraceae	<i>Oenothera biennis</i>
			Asteraceae	<i>Erigeron annuus</i>
			"	<i>Crepidiastrum sonchifolium</i>
			"	<i>Cirsium japonicum</i>
			"	<i>Carduus crispus</i>
			Valerianaceae	<i>Valeriana fauriei</i>
			Rosaceae	<i>Spiraea salicifolia</i>
			"	<i>Rubus idaeus</i>
			Boraginaceae	<i>Trigonotis peduncularis</i>
			Scrophulariaceae	<i>Veronicastrum sibiricum</i>
		Primulaceae	<i>Lysimachia clethroides</i>	
		Staphyleaceae	<i>Staphylea bumalda</i>	
		Aceraceae	<i>Acer tataricum</i>	
		Hydrangeaceae	<i>Philadelphus schrenkii</i>	
<i>Argynnis nerippe</i>	Violaceae	<i>Viola</i> sp.	Fabaceae	<i>Lespedeza cyrtobotrya</i>
			Asteraceae	<i>Cirsium japonicum</i>
			"	<i>Erigeron annuus</i>
			"	<i>Cosmos bipinnatus</i>
			"	<i>Senecio nemorensis</i>
			"	<i>Cirsium pendulum</i>
			"	<i>Inula japonica</i>
			"	<i>Coreopsis basalis</i>
			"	<i>Zinnia elegans</i>
			"	<i>Breca segeta</i>
			Primulaceae	<i>Lysimachia clethroides</i>
			Lamiaceae	<i>Scabiosa comosa</i>
			Rosaceae	<i>Sorbaria sorbifolia</i>
Valerianaceae	<i>Patrinia serratulifolia</i>			
Lamiaceae	<i>Prunella vulgaris</i>			
Geraniaceae	<i>Geranium koreanum</i>			

Table 1. Continued.

Butterfly species	Host plant		Nectar plant	
	Family	Species	Family	Species
<i>Leptalina unicolor</i>	Poaceae	<i>Spodipogon cotulifer</i>	Fabaceae	<i>Trifolium repens</i>
	"	<i>Spodipogon sibiricus</i>	Hydrangeaceae	<i>Deutzia uniflora</i>
	"	<i>Miscanthus sinensis</i>	Asteraceae	<i>Erigeron annuus</i>
	"	<i>Imperata cylindrica</i>	Liliaceae	<i>Lilium</i> sp.
	"	<i>Setaria viridis</i>	Valerianaceae	<i>Valeriana dageletiana</i>
	"	<i>Miscanthus sinensis</i>		
	"	<i>Phragmites australis</i>		
<i>Chalinga pratti</i>	Pinaceae	<i>Pinus koraiensis</i>	Asteraceae	<i>Erigeron annuus</i>
			Apiaceae	<i>Heracleum moellendorffii</i>
<i>Phengaris kurentzovi</i>	Rosaceae	<i>Sanguisorba officinalis</i>	Rosaceae	<i>Sanguisorba officinalis</i>
			Lamiaceae	<i>Scabiosa comosa</i>
			Asteraceae	<i>Cirsium japonicum</i>
<i>Phengaris teleius</i>	Rosaceae	<i>Sanguisorba officinalis</i>	Rosaceae	<i>Sanguisorba officinalis</i>
	"	<i>Sanguisorba tenuifolia</i>	"	<i>Spiraea salicifolia</i>
	"	<i>Sanguisorba hakusanensis</i>	Asteraceae	<i>Cirsium japonicum</i>
<i>Plebejus subsolanus</i>	Fabaceae	<i>Vicia unijuga</i>	Fabaceae	<i>Lespedeza bicolor</i>
			Lythraceae	<i>Lythrum salicaria</i>
	"	<i>Vicia amoena</i>	Lamiaceae	<i>Clinopodium chinense</i>
			Crassulaceae	<i>Phedimus aizoon</i>
			Asteraceae	<i>Erigeron annuus</i>
			"	<i>Cirsium japonicum</i>
			Fabaceae	<i>Vicia amoena</i>
"	"	<i>Trifolium repens</i>		
Scrophulariaceae	<i>Pseudolysimachion liniifolium</i>			
<i>Melitaea latefascia</i>	Hydrangeaceae		Hydrangeaceae	<i>Deutzia parviflora</i>
	Scrophulariaceae	<i>Siphonostegia chinensis</i>	Asteraceae	<i>Erigeron annuus</i>
	"	<i>Veronica undulata</i>	"	<i>Cirsium japonicum</i>
	Plantaginaceae	<i>Plantago asiatica</i>	"	<i>Breea segeta</i>
			Fabaceae	<i>Trifolium repens</i>
			"	<i>Lespedeza bicolor</i>
			"	<i>Astragalus sinicus</i>
			Primulaceae	<i>Lysimachia clethroides</i>
			Brassicaceae	<i>Arabis hirsuta</i>
			Rosaceae	<i>Rubus crataegifolius</i>
		"	<i>Potentilla fragarioides</i>	
		Hydrangeaceae	<i>Philadelphus tenuifolius</i>	

Table 2. Butterfly species using host and nectar plants as food sources

Host plant			Nectar plant		
Plant family	Butterfly species	Plant species	Butterfly species	Plant species	Butterfly species
Juglandaceae	<i>Protantigonus superans</i>	<i>Sanguisorba tenuifolia</i>	<i>Phengaris teleius</i>	<i>Vicia unijuga</i>	<i>Plebejus subsolanus</i>
"	<i>Aporia crataegi</i>	<i>Carex humilis</i>	<i>Hipparchia autonoe</i>	"	<i>Aporia crataegi</i>
Asteraceae	<i>Melitaea ambigua</i>	<i>Juglans mandshurica</i>	<i>Protantigonus superans</i>	<i>Erigeron annuus</i>	<i>Melitaea latefascia</i>
Crassulaceae	<i>Parnassius bremeri</i>	<i>Phragmites australis</i>	<i>Leptalina unicolor</i>	"	<i>Plebejus subsolanus</i>
Salicaceae	<i>Protantigonus superans</i>	<i>Vicia unijuga</i>	<i>Plebejus subsolanus</i>	"	<i>Cigaritis takanonis</i>
Poaceae	<i>Hipparchia autonoe</i>	<i>Setaria viridis</i>	<i>Leptalina unicolor</i>	"	<i>Melitaea ambigua</i>
"	<i>Leptalina unicolor</i>	<i>Elymus tsukushiensis</i>	<i>Hipparchia autonoe</i>	"	<i>Argynnis nerippe</i>
Cyperaceae	<i>Hipparchia autonoe</i>	<i>Prunus armeniaca</i>	<i>Aporia crataegi</i>	"	<i>Leptalina unicolor</i>
Pinaceae	<i>Chalanga pratti</i>	<i>Malus micromalus</i>	<i>Aporia crataegi</i>	"	<i>Sinia divina</i>
Betulaceae	<i>Aporia crataegi</i>	<i>Sophora flavescens</i>	<i>Sinia divina</i>	"	<i>Chalanga pratti</i>
Rosaceae	<i>Phengaris teleius</i>	<i>Spodiopogon cotulifer</i>	<i>Leptalina unicolor</i>	<i>Philaediphus schrenkii</i>	<i>Melitaea ambigua</i>
"	<i>Phengaris kurentzovi</i>	<i>Phedimus aizoon</i>	<i>Parnassius bremeri</i>	<i>Crepidiastrum sonchifolium</i>	<i>Melitaea ambigua</i>
"	<i>Aporia crataegi</i>	<i>Festuca ovina</i>	<i>Hipparchia autonoe</i>	<i>Sophora flavescens</i>	<i>Sinia divina</i>
Violaceae	<i>Argynnis nerippe</i>	<i>Vicia unijuga</i>	<i>Plebejus subsolanus</i>	<i>Staphylea bumalda</i>	<i>Melitaea ambigua</i>
Plantaginaceae	<i>Melitaea latefascia</i>	<i>Veronicastrum sibiricum</i>	<i>Melitaea ambigua</i>	<i>Coreopsis basalis</i>	<i>Argynnis nerippe</i>
"	<i>Melitaea ambigua</i>	<i>Imperata cylindrica</i>	<i>Leptalina unicolor</i>	<i>Senecio nemorensis</i>	<i>Hipparchia autonoe</i>
Fabaceae	<i>Plebejus subsolanus</i>	<i>Sorbus commixta</i>	<i>Aporia crataegi</i>	"	<i>Argynnis nerippe</i>
"	<i>Sinia divina</i>	<i>Chaenomeles speciosa</i>	<i>Aporia crataegi</i>	<i>Inula japonica</i>	<i>Argynnis nerippe</i>
Scrophulariaceae	<i>Melitaea latefascia</i>	<i>Veronica undulata</i>	<i>Melitaea latefascia</i>	<i>Phedimus aizoon</i>	<i>Parnassius bremeri</i>
"	<i>Melitaea ambigua</i>	"	<i>Melitaea ambigua</i>	"	<i>Plebejus subsolanus</i>
"	"	<i>Pyrus pyrifolia</i>	<i>Aporia crataegi</i>	<i>Lysimachia barystachys</i>	<i>Protantigonus superans</i>
"	"	<i>Prunus serrulata</i>	<i>Aporia crataegi</i>	<i>Spiraea salicifolia</i>	<i>Phengaris teleius</i>
"	"	<i>Malus pumila</i>	<i>Aporia crataegi</i>	"	<i>Melitaea ambigua</i>
"	"	<i>Populus davidiana</i>	<i>Protantigonus superans</i>	<i>Pseudolysimachion linearifolium</i>	<i>Plebejus subsolanus</i>
"	"	<i>Crataegus pinnatifida</i>	<i>Aporia crataegi</i>	<i>Trigonotis peduncularis</i>	<i>Melitaea ambigua</i>
"	"	<i>Sanguisorba hakusanensis</i>	<i>Phengaris teleius</i>	<i>Prunella vulgaris</i>	<i>Hipparchia autonoe</i>
"	"	<i>Prunus armeniaca</i>	<i>Aporia crataegi</i>	"	<i>Argynnis nerippe</i>
"	"	<i>Melampyrum roseum</i>	<i>Melitaea ambigua</i>	"	<i>Sinia divina</i>
"	"	<i>Prunus sibirica</i>	<i>Aporia crataegi</i>	<i>Barbarea orthoceras</i>	<i>Melitaea ambigua</i>
"	"	<i>Miscanthus sinensis</i>	<i>Leptalina unicolor</i>	<i>Lilium sp.</i>	<i>Leptalina unicolor</i>
"	"	<i>Sanguisorba officinalis</i>	<i>Phengaris teleius</i>	<i>Rubus idaeus</i>	<i>Parnassius bremeri</i>
"	"	"	<i>Phengaris kurentzovi</i>	"	<i>Melitaea ambigua</i>
"	"	<i>Betula pendula</i>	<i>Aporia crataegi</i>	<i>Veronicastrum sibiricum</i>	<i>Melitaea ambigua</i>
"	"	<i>Pinus koraiensis</i>	<i>Chalanga pratti</i>	<i>Valeriana dageletiana</i>	<i>Leptalina unicolor</i>
"	"	<i>Siphonostegia chinensis</i>	<i>Melitaea latefascia</i>	<i>Oenothera biennis</i>	<i>Melitaea ambigua</i>
"	"	"	<i>Melitaea ambigua</i>	<i>Climopodium micranthum</i>	<i>Hipparchia autonoe</i>
"	"	<i>Viola sp.</i>	<i>Argynnis nerippe</i>	<i>Geranium koreanum</i>	<i>Argynnis nerippe</i>

Table 2. Continued.

Host plant		Nectar plant			
Plant family	Butterfly species	Plant species	Butterfly species	Plant species	Butterfly species
	<i>Artemisia japonica</i>	<i>Melitaea ambigua</i>	<i>Melitaea latefascia</i>	<i>Rubus</i> sp.	<i>Sinia divina</i>
	<i>Plantago asiatica</i>	<i>Melitaea latefascia</i>	<i>Melitaea ambigua</i>	<i>Patrinia serratulifolia</i>	<i>Argynnis nerippe</i>
		<i>Melitaea ambigua</i>	<i>Protantigius superans</i>	<i>Deutzia parviflora</i>	<i>Plebejus subsolanus</i>
	<i>Miscanthus sinensis</i>	<i>Leptalina unicolor</i>	<i>Melitaea latefascia</i>	<i>Deutzia uniflora</i>	<i>Leptalina unicolor</i>
	<i>Spodiopogon sibiricus</i>	<i>Leptalina unicolor</i>	<i>Cigaritis takanonis</i>	<i>Brassica sativus</i>	<i>Melitaea ambigua</i>
	<i>Malus mandshurica</i>	<i>Aporia crataegi</i>	<i>Melitaea ambigua</i>	<i>Cardamine leucantha</i>	<i>Melitaea ambigua</i>
	<i>Carex erythrobasis</i>	<i>Hipparchia autonoe</i>	<i>Argynnis nerippe</i>	<i>Castanea crenata</i>	<i>Cigaritis takanonis</i>
	<i>Rosa rugosa</i>	<i>Aporia crataegi</i>	<i>Phengaris teleiuis</i>	<i>Brassica rapa</i>	<i>Melitaea ambigua</i>
	<i>Juglans regia</i>	<i>Protantigius superans</i>	<i>Melitaea latefascia</i>	<i>Thymus quinquecostatus</i>	<i>Hipparchia autonoe</i>
		<i>Aporia crataegi</i>	<i>Phengaris kurentzovi</i>	<i>Zinnia elegans</i>	<i>Argynnis nerippe</i>
			<i>Parnassius bremeri</i>	<i>Lythrum salicaria</i>	<i>Phengaris teleiuis</i>
			<i>Melitaea ambigua</i>	<i>Rubus crataegifolius</i>	<i>Melitaea latefascia</i>
			<i>Argynnis nerippe</i>	"	<i>Parnassius bremeri</i>
			<i>Sinia divina</i>	<i>Scabiosa comosa</i>	<i>Phengaris kurentzovi</i>
			<i>Argynnis nerippe</i>	"	<i>Hipparchia autonoe</i>
			<i>Melitaea ambigua</i>	"	<i>Argynnis nerippe</i>
			<i>Cigaritis takanonis</i>	<i>Pedicularis resupinata</i>	<i>Hipparchia autonoe</i>
			<i>Phengaris teleiuis</i>	<i>Sorbaria sorbifolia</i>	<i>Argynnis nerippe</i>
			<i>Protantigius superans</i>	<i>Acer tataricum</i>	<i>Melitaea ambigua</i>
			<i>Melitaea latefascia</i>	<i>Lespedeza bicolor</i>	<i>Phengaris teleiuis</i>
			<i>Parnassius bremeri</i>	"	<i>Melitaea latefascia</i>
			<i>Plebejus subsolanus</i>	<i>Robinia pseudoacacia</i>	<i>Parnassius bremeri</i>
			<i>Aporia crataegi</i>	<i>Philadelphus tenuifolius</i>	<i>Melitaea latefascia</i>
			<i>Melitaea ambigua</i>	<i>Potentilla fragarioides</i>	<i>Melitaea latefascia</i>
			<i>Argynnis nerippe</i>	<i>Heracleum moellendorffii</i>	<i>Chalinga pratti</i>
			<i>Leptalina unicolor</i>	<i>Cirsium japonicum</i>	<i>Phengaris teleiuis</i>
			<i>Sinia divina</i>	"	<i>Melitaea latefascia</i>
			<i>Hipparchia autonoe</i>	"	<i>Phengaris kurentzovi</i>
			<i>Plebejus subsolanus</i>	"	<i>Parnassius bremeri</i>
			<i>Melitaea ambigua</i>	"	<i>Hipparchia autonoe</i>
				"	<i>Plebejus subsolanus</i>
				"	<i>Aporia crataegi</i>
				"	<i>Melitaea ambigua</i>
				"	<i>Argynnis nerippe</i>
				"	<i>Sinia divina</i>
				<i>Sanguisorba officinalis</i>	<i>Phengaris teleiuis</i>
				"	<i>Phengaris kurentzovi</i>

Table 2. Continued.

Host plant		Nectar plant	
Plant family	Butterfly species	Plant species	Butterfly species
		<i>Pisum sativum</i>	<i>Protantigius superans</i>
		<i>Astragalus sinicus</i>	<i>Melitaea latefascia</i>
		<i>Berteroella maximowiczii</i>	<i>Melitaea ambigua</i>
		<i>Breca segeta</i>	<i>Melitaea latefascia</i>
		"	<i>Aporia crataegi</i>
		"	<i>Argynnis nerippe</i>
		"	<i>Sinia divina</i>
		<i>Valeriana fauriei</i>	<i>Parnassius bremeri</i>
		"	<i>Melitaea ambigua</i>
		<i>Carduus crispus</i>	<i>Melitaea ambigua</i>
		<i>Lespedeza cyrtobotrya</i>	<i>Argynnis nerippe</i>
		<i>Clinopodium chinense</i>	<i>Phengaris teleius</i>
		<i>Cosmos bipinnatus</i>	<i>Argynnis nerippe</i>
		<i>Lysimachia clethroides</i>	<i>Protantigius superans</i>
		"	<i>Melitaea latefascia</i>
		"	<i>Cigaritis takanonis</i>
		"	<i>Melitaea ambigua</i>
		"	<i>Argynnis nerippe</i>
		<i>Cirsium pendulum</i>	<i>Argynnis nerippe</i>
		<i>Arabis hirsuta</i>	<i>Melitaea latefascia</i>
		"	<i>Melitaea ambigua</i>
		<i>Trifolium repens</i>	<i>Melitaea latefascia</i>
		"	<i>Plebejus subsolanus</i>
		"	<i>Aporia crataegi</i>
		"	<i>Melitaea ambigua</i>
		"	<i>Leptalina unicolor</i>
		"	<i>Sinia divina</i>
		<i>Dianthus chinensis</i>	<i>Aporia crataegi</i>
		<i>Pedicularis hallaisanensis</i>	<i>Hipparchia autonoe</i>

outcome in restoration programs for endangered butterfly species. This review represents the first comprehensive summary of the host and nectar plants of all endangered butterflies in South Korea. The information provided on the host and nectar plants of these species will be invaluable and can be leveraged to effectively establish future restoration plans for endangered butterflies.

Author Contributions

The authors confirm their contributions to the paper as follows: Munki Paek conducted the study conception and design, analyzed and interpreted results, and prepared the draft manuscript (in Korean); Youngho Cho assisted in study conception and design and confirmed the scientific names of butterflies; Ji Yeong Kim translated references (in English) and edited the manuscript; Dukyeop Kim confirmed scientific names and translated the common names of plants (in English); Baek-Jun Kim analyzed and interpreted results, edited the manuscript, prepared the draft manuscript (in English), and handled correspondence.

Conflict of Interest

The authors have no competing interests relevant to this study to disclose.

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