

Native Orchids in Southeast Alaska



Marlin Bowles & Bob Armstrong

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Preface

Southeast Alaska's rainforests, peatlands and alpine habitats support a wide variety of plant life. The composition of this vegetation is strongly influenced by patterns of plant distribution and geographical factors. For example, the ranges of some Asian plant species extend into Southeast Alaska by way of the Aleutian Islands; other species extend northward into this region along the Pacific coast or southward from central Alaska. Included in Southeast Alaska's vegetation are at least 27 native orchid species and varieties whose collective ranges extend from Mexico north to beyond the Arctic Circle, and from North America to northern Europe and Asia. These orchids survive in a delicate ecological balance, requiring specific insect pollinators for seed production, and mycorrhizal fungi that provide nutrients essential for seedling growth and survival of adult plants. These complex relationships can lead to vulnerability to human impacts. Orchids also tend to transplant poorly and typically perish without their fungal partners. They are best left to survive as important components of biodiversity as well as resources for our enjoyment.

Our goal is to provide a useful description of Southeast Alaska's native orchids for readers who share enthusiasm for the natural environment and desire to learn more about our native orchids. This book addresses each of the native orchids found in the area of Southeast Alaska extending from Yakutat and the Yukon border south to Ketchikan and the British Columbia border. For each species, we include a brief description of its distribution, habitat, size, mode of reproduction, and pollination biology. We provide photographic illustrations of plants in their natural habitat, which will assist with identification. Links to pollinator videos are also provided for several species. By describing where these species grow and what insects pollinate their flowers, we hope to increase appreciation for the importance of understanding and protecting the intricate ecological systems that support native orchids and their associated organisms. Little information is available about the pollination biology of many of these species; this represents a major gap in knowledge about their reproductive requirements.

This book has three major sections. The introduction first addresses features that characterize orchids and help distinguish them from species of other plant families. This is followed by a brief review of the Southeast climate in relation to vegetation and orchid distribution. This is followed by a discussion of primary orchid habitats, and finally a history of orchid collecting in Southeast Alaska. The second section begins with a

dichotomous key to the genera of native orchids treated in this book. This is followed by brief descriptions of each genus, which lead into treatments of each species in alphabetical order. The third section of the book includes recommended reading and references, internet resources, a glossary, and distribution maps.

Plant species usually have two types of names. A common English, or vernacular, name reflects non-scientific terms that may vary across regions. A "scientific" name is a binomial of Latin or Greek terms applied to the plant "genus" and "species"; it usually appears in *italics* and the genus is capitalized. A genus is a categorical ranking below a family and above a species level, and includes groups of "species" that are structurally and genetically similar, but different from each other. This book addresses plants belonging to the Orchidaceae plant family. Ten orchid genera are represented by 27 species in Southeast Alaska. For example, the scientific name for the fairy slipper, *Calypso bulbosa*, includes the genus *Calypso* and the species name *bulbosa*. Subgroups within species may include varieties and forms. Each name has been applied by an author, whose name may be added for clarification. For example *Calypso bulbosa* (Linnaeus) Oakes means that the Swedish botanist Linnaeus first named this plant, but that Oakes renamed it using the name now in use.

The scientific naming of plants seems to be in constant flux, with new names replacing those familiar from the past. In this treatment, we use the names applied in P.M. Brown's *Orchids of the Pacific Northwest and Canadian Rockies*. This is the most recent book covering Alaskan orchids, and we recommend it. We indicate if more recent generic or species name changes have been recommended by the scientific community, and we also use some common names that may be more familiar than the ones applied in this book.

Southeast Alaska is a challenging landscape for plant studies because it includes an island archipelago. Access to islands is often limited by boat or air travel, and the absence of roadways further limits travel on most islands. To the extent possible we have supplemented gaps in knowledge with herbarium and other on-line resources, as well as personal information from naturalists in various regions.

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Introduction to Orchids

Orchids are placed within the monocotyledons, one of the two major flowering plant groups. The monocots include grasses as well as many showy plants such as iris and lily species, and the orchids may have evolved from a primitive lily ancestor. Orchids comprise the Orchidaceae plant family, which is the largest in the world. It contains about 25,000 orchid species, which includes about 8% of all plant species. Orchids are most abundant in the tropics, where the majority of these plants are epiphytic, growing on trees. However, orchids also occur northward in temperate areas of North America, Europe, and Asia, where they are terrestrial, rooting in soil. Some even occur north of Arctic Circle. About 33 species and varieties occur in Alaska, 27 of which are known to occur in the southeast part of the state.

Orchids differ from other monocots by having more specialized flowers that are highly adapted to attract and manipulate insects for cross-pollination. As in many lilies, orchids have an outer whorl of three sepals and an inner whorl of three petals. However, one orchid petal (the lip) is extremely modified, and often showy, to guide specific insect pollinators. When in bud the lip is uppermost but usually the flower stalk twists 180 degrees to place the lip lowermost, or resupinate. A nectar reward is often provided to insect pollinators; it may be stored in a recessed nectary or spur that determines insect tongue length required to access the nectar. Some species appear to offer food, but do not, which is referred to as "food deception." The shape of the lip and length of the nectar spur are key features in species identification. Many different orchid species are cross-compatible and capable of hybridization. Their use of specific insect species as agents for pollen transfer helps maintain orchid species by avoiding such hybridization. Some orchid species may share pollinators by placing pollen (see below) on different body parts, such as the compound eyes, tongues, or thorax, which will not come into contact with the stigma of different species. Other orchid species may be pollinator generalists, and place pollen on different body parts of different pollinators.

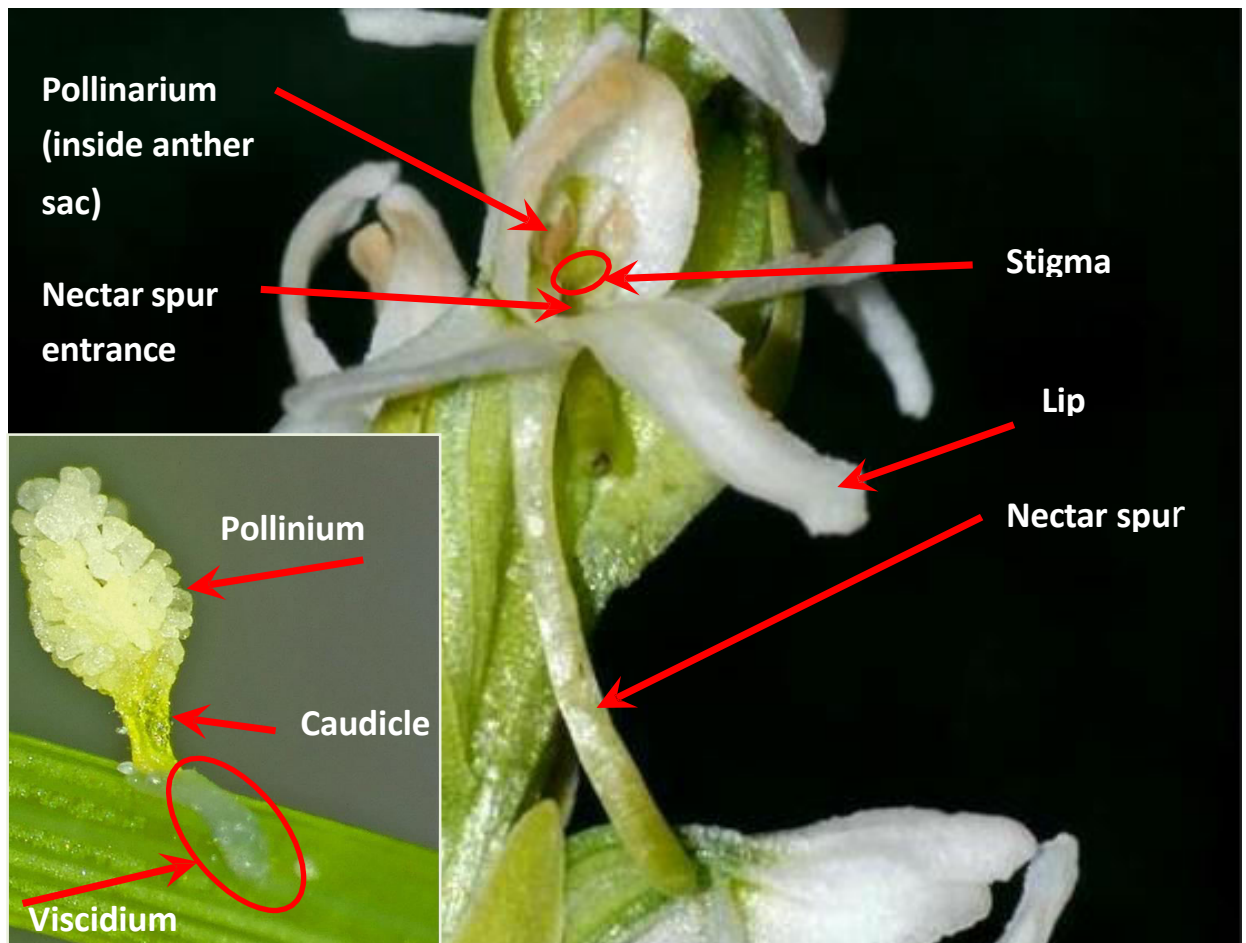
The reproductive structures of orchids are fused into an organ called the column, which positions the anthers for deposition of pollen on visiting

pollinators, and the stigma to receive pollen carried by pollinators. Most orchids have a single anther that contains two or more pollen masses, or pollinia (pollinium is singular). Pollinia are usually attached directly to pollinators by a glue, or by a stalk (caudicle) with an adhesive disk (viscidium) that adheres to the pollinator (see illustration of orchid flower anatomy). The pollinium, caudicle, and viscidium are termed a pollinarium. Insects carry pollinia to a different plant in search of food, where they in contact with the plant's stigma and deposits pollen grains, completing cross-pollination. Some orchids may self-pollinate by depositing their own pollinia, or pollen, onto the stigma. Such plants are referred to as autogamous. This has been thought to be advantageous in environments that lack diversity of pollinators.



Orchid flowers are usually adapted to the size, shape, and energy demands of their pollinators. The length of the tongue on this bedstraw hawkmoth allows it to extract nectar from the elongated nectar spur of the white bog orchid. In doing so, it extracts pollinia that are carried to another white bog orchid.

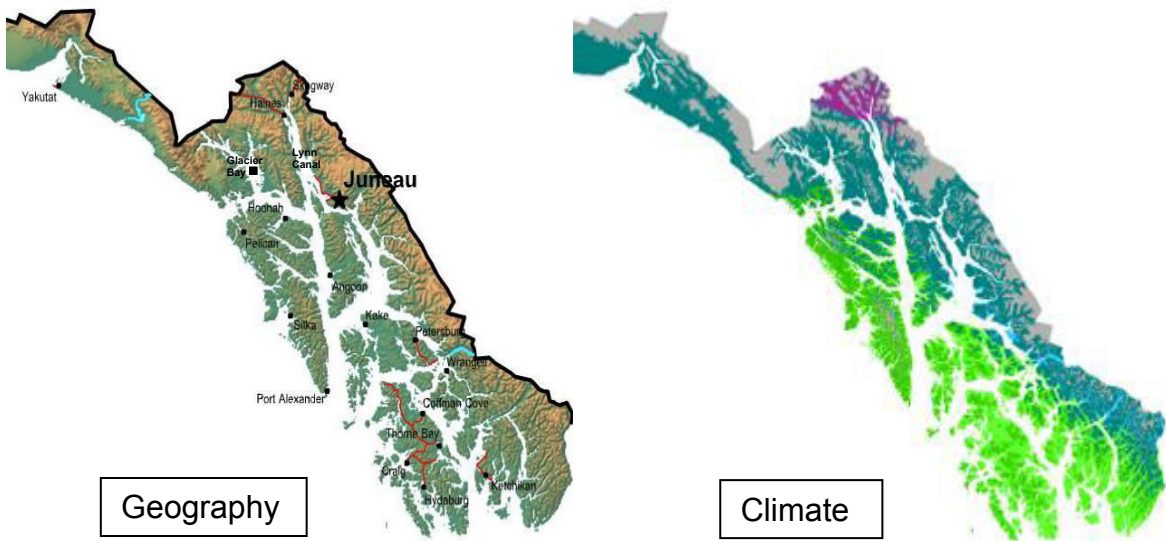
All orchid species are perennial, though some may not flower annually, and others may enter dormancy and absence from an above-ground state for a year or more. Orchids produce thousands of microscopic seeds that have no food supply (endosperm). Seedlings are mycotrophic, meaning that they receive nutrients from soil fungi through mycorrhizae, which are contact zones in which fungal hyphae enter cells of the seedling root. Seedlings have a slow rate of growth, and an extended juvenile period. Adult leaf-bearing plants have a poorly developed root system, and usually continue to supplement their products of photosynthesis through mycorrhizae. Some orchids, such as *Corallorhiza* species, lack leaves and chlorophyll and are remain mycotrophic.



Anatomy of a white bog orchid flower showing organization of reproductive parts. Pollinaria are enclosed in anther sacs located on either side of the stigma, which is located above the entrance to the nectar spur. Insects contact a viscidium and remove a pollinarium while probing for nectar. Inset shows a pollinarium removed from the anther sac and adhered by its viscidium.

The presence of orchids often indicates lack of human disturbance. Many terrestrial species also occupy specific and predictable habitats. They may be sensitive to soil characteristics such as the range from acidic to alkaline soil reaction (measured by pH), and usually require habitat-specific mycorrhizal fungi. The large number of orchid species, their habitats, pollinators, and fungal partners are important components of biodiversity and are thus valuable subjects for conservation. They are also valuable for evolutionary and ornamental research, and make up a large component of ornamental plant trade.

Orchids in Southeast Alaska



Map by Adam Peterson - Own work,
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Köppen climate type

■ BSk (Cold semi-arid)	■ Dwc (Subarctic)
■ Cfb (Oceanic)	■ Dfb (Warm-summer humid continental)
■ Cfc (Subpolar oceanic)	■ Dfc (Subarctic)
■ Dsb (Warm-summer mediterranean continental)	■ ET (Tundra)
■ Dsc (Dry-summer subarctic)	■ EF (Ice-cap)

*Isotherm used to separate temperate (C) and continental (D) climates is -3°C
Data source: Climate types calculated from data from WorldClim.org

Landmass and climate - Southeast Alaska is a 500-mile (800 km) long landscape of almost 2000 small to extremely large islands and a narrow border of coastline and adjacent mountains that reach over 8,000 ft (2,500 m) above sea level. Many of these mountains, especially in the northeast, are capped by glacial ice fields. The climate of Southeast Alaska ranges from a subarctic, warm-dry continental regime in the north to a wet maritime regime in the south. An oceanic effect moderates the climate of outer and southern islands, producing mild, wet winters and cool, wet summers. Annual precipitation averages over 100 inches (300 cm) of winter snow and summer rain. The amount varies with latitude, and is higher in the south.

Soils and vegetation - Soils are primarily acidic and derived from glacial material or partially decomposed plant material of forests or peatlands. They are often complex due to variation in underlying bedrock that may range from more acid granite to alkaline limestone.

Vegetation changes across altitudinal, latitudinal and successional gradients. At lower elevations, the predominant vegetation is northern rainforest of Sitka spruce and western hemlock, or muskeg peatland with shore pine and mountain hemlock. This vegetation transitions to spruce and mountain hemlock forest and then alpine meadow at higher elevations. Black cottonwood forest or lowland fens and marshes occur along rivers or coastal tidelands throughout the area. From Glacier Bay northward, lodgepole pine or paper birch may establish after glaciation, or after disturbance such as fire. High plant diversity occurs in upper Lynn Canal as well as in Glacier Bay. In the southern third of Southeast Alaska, western red cedar is abundant below 1000 ft (300 m) elevation in forests and muskeg. This southern vegetation includes many other woody and herbaceous plant species that do not extend farther north.

Orchid Distribution and Habitats in Southeast Alaska

Native orchids occur throughout Southeast Alaska, occupying almost all types of forest and non-forest vegetation. None of these orchid species is restricted to Alaska, and they exhibit at least three different distributional patterns. A few species, including Chamisso's orchid (*Platanthera chorisiana*) and the two-leaved adder's mouth (*Malaxis diphyllus*), occur from Japan eastward through the Aleutian Islands to western and southeast Alaska and coastal British Columbia. These species occupy primarily open coastal habitats such as meadows and peatlands. Members of a second group extend northward from the Pacific Northwest and reach their northern range limits in Southeast Alaska forest habitat. Examples include the western fairy slipper (*Calypso bulbosa* var. *occidentalis*), northwestern twayblade (*Listera banksiana*), and western coralroot (*Corallorhiza mertensiana*). More widespread western species that reach Alaska include wetland species

such as the slender bog orchid (*Platanthera stricta*) and shrubland species such as the Alaska piperia (*Piperia unalascensis*). A third group includes species that occur across the northern North American continent and reach their western range limit in Alaska. Examples include the eastern fairy slipper (*Calypso bulbosa* var. *americana*), yellow lady's slipper (*Cypripedium parviflorum*), and northern bog orchid (*Platanthera aquilonis*). A few species in the third group have bi-modal distributions, occurring in eastern and western, but not central, North America. Examples include the broad-lipped twayblade (*Listera convallarioides*), the round-leaved orchid (*Platanthera orbiculata*) and the green bog orchid (*Platanthera huronensis*).

For convenience, Southeast Alaska's orchids also can be placed into three groups defined by their adaptations to light levels. They include 1) shade-tolerant species of forest habitats, 2) shade-intolerant species of open habitats, and 3) light-flexible species that occur across a range of light conditions. Exceptions probably occur for plants assigned to each of these categories, but they help provide a context for understanding where different species usually occur.

Shade-tolerant forest

species – These are plants that occur in shaded forests. Such species would be efficient at conducting photosynthesis at low light levels, or would have alternative methods of gaining resources. Forest habitats support at least 11 orchid species, including the twayblades (*Listera*), fairy slipper (*Calypso*), two rein orchids (*Platanthera*), the rattlesnake plantain orchid (*Goodyera*), the long-bracted orchid (*Coeloglossum viride* var. *viride*), and the coralroots (*Corallorhiza*). The coralroot orchids stand out from the other species because they are mycotrophic. Another species, the fairy slipper, has a winter green leaf and may capture light during winter when more sunlight is available. In the



Old-growth coastal spruce-hemlock forest.

Juneau area, these species occur principally near sea-level in coastal or riverine forests. However, some of these species, especially twayblades, also occur in higher elevation montane forests in other areas of Southeast Alaska.

Shade-intolerant species –

Unshaded habitats support at least 10 orchid species that tend to avoid forest shade. Such plants may be inefficient at conducting photosynthesis at low light levels. Their habitats include saturated peat soils of muskeg and fen as well as meadows developed on glacial deposits. Shade-intolerant species include most of the rein orchids (*Platanthera*), adder's mouth orchids (*Malaxis*), the northern-bracted orchid (*Coeloglossom viride* var. *virescens*), and hooded ladies' tresses (*Spiranthes romanzoffiana*).



Muskeg with shore pine and mountain hemlock.

Light-flexible species - These species may occur across a range of light from sun to partial shade. In forests, they tend to occupy light gaps or open canopies; or, they may persist as non-flowering plants in shade, but flower under greater light levels. They also occur in transitional shrublands as well as bogs or fens and open meadows. This group includes the lady's slippers (*Cypripedium*) and *Piperia* species. Members of the shade-tolerant and shade-intolerant groups may appear to be light-flexible in some habitats, such as forest light gaps or edges of muskeg or beach fringes.

Historical Plant Collecting: Roots of our Knowledge

In Southeast Alaska, botanical collecting of native orchids occurred as early as the late 1800s. In 1891, Grace E. Cooley, from Wellesley College, Mass., collected about 250 plant species during a 5-week trip across Southeast Alaska and adjacent British Columbia. Included in this collection were seven orchid species.

Beginning in the late 1930s, the Juneau Botanical Club and its mentor, Jacob P. Anderson, collected extensively in Southeast Alaska. Anderson's collections were the basis for his 1959 book, *Flora of Alaska and Adjacent Parts of Canada*, and many of his specimens are now housed in the University of Alaska herbarium, Fairbanks. Eric Hultén also collected in Southeast Alaska for his 1968 book *Flora of Alaska and neighboring territories*. This book included distribution maps and more modern nomenclature, which were advancements over Anderson's book.



Jacob P. Anderson (Swedell 1999)

The Juneau Botanical Club continued for 40 years, and its collection of about 5000 specimens is now housed in the Alaska State Museum. This collection includes almost 20 orchid species representing over 50 different localities, primarily in the Juneau and Haines areas. More recently, botanical collections from the Tongass National Forest, Glacier Bay National Park, and surrounding areas have increased our knowledge of the number of orchid species and their distributions in Southeast Alaska. These specimens are housed primarily in the herbariums of the U.S. Forest Service, National Park Service, and the University of Alaska, Fairbanks.

Key to Orchid Genera in Southeast Alaska

The following key allows identification of orchid genera without removing plants from their habitats. In some cases individual flowers will need to be examined with a 10-x hand lens. *Platanthera* occurs at multiple steps in the key due to variability among species in this genus. Descriptions of each genus follow the key. Individual species treatments appear alphabetically after the genus descriptions.

- 1a. Typically 1-4 flowers, with large inflated lips resembling a slipper:
 - 2a. Lip multi-colored with an extended apron; flowering stalk without leaves; a single basal wintergreen leaf present: Fairy slipper (*Calypso*)
 - 2b. Lip solid colored or with faint spots, without an apron; flowering stalk with leaves; lacking a basal wintergreen leaf: Lady's slipper (*Cypripedium*)
- 1b. Multiple flowers in a single inflorescence; lips not large and inflated:
 - 3a. Plants without green leaves: Coralroot (*Corallorhiza*)
 - 3b. Plants with green leaves:
 - 4a. Flowers without nectar spurs:
 - 5a. Leaves evergreen with white veins; inflorescence a one-sided spike of white flowers: Rattlesnake plantain orchid (*Goodyera*).
 - 5b. Leaves not evergreen and lacking white veins; inflorescence not one-sided:
 - 6a. Flowers green or red-green:
 - 7a. Leaves equal and paired midway along the stem; flowers resupinate with a prominent lip: Twayblade (*Listera*)
 - 7b. Leaves appearing basal, one slightly larger and clasping the leaf above; flowers non-resupinate, lip not prominent: Adder's mouth (*Malaxis*)
 - 6b. Flowers white: Ladies tresses (*Spiranthes*)
 - 4b. Flowers with nectar spurs:
 - 7a. Leaves only basal, or bract like below the inflorescence:
 - 8a: single basal leaf: Rein orchid (*Platanthera*)
 - 8b. two basal leaves:
 - 9a: Flowers with lip and spur > 10 mm long: Rein orchid (*Platanthera*)
 - 9b. Flowers with lip and spur < 10mm long:
 - 10a. Lip and spur > 5mm: Piperia (*Piperia*)
 - 10b. Lip and spur < 5mm: Rein orchid (*Platanthera*)
 - 7b. Leaves present on the flowering stalk, basal leaves present or absent:
 - 11a. Lip notched at the tip: Bracted orchid (*Coeloglossum*)
 - 11b. Lip not notched at the tip: Rein orchid (*Platanthera*)

***Calypso* (Fairy slipper)**

The genus *Calypso* contains a single species with four varieties that occur in the boreal and mountainous regions of the northern hemisphere. There are two varieties in North America, including Southeast Alaska, and single varieties in Japan and northern Europe and Asia. This genus is characterized by an inflated lip, and was originally combined with the lady's slippers (*Cypripedium*), which it resembles. Bees are the principal pollinators, and are attracted by food deception. The column of *Calypso* extends over the lip opening. The anther contains two pairs of pollinia in a single pollinarium that is attached to the dorsal thorax of a pollinator as it withdraws from the flower. Upon entering another flower, pollen are first deposited on the stigma as the bee withdraws, followed by removal of pollinia from that flower.

***Coeloglossum* (Bracted orchid)**

Coeloglossum contains a single species with two varieties that occur in the northern and mountainous regions of the northern hemisphere in North America, Europe, and Asia. Both varieties occur in North America and Alaska. Early authors combined this genus with *Piperia* and *Platanthera* in the genus *Habenaria*. It is now recognized as more strongly related to the Eurasian genus *Dactylorhiza*. Nectar is provided at the base of the lip and in a short spur. Pollinia are positioned on either side of the spur entrance and are attached to insects by viscidia. Flowers also may self-pollinate.

***Corallorhiza* (Coralroot)**

The coralroots are primarily North American, where there are 12 species, two of which occur in Southeast Alaska. There are several other species in Central America and Europe. Species in this genus do not produce leaves and are usually dependent upon mycorrhizal fungi for nutrients. One species conducts photosynthesis in its stem, which supplements mycorrhizal resources. Flowers have a single anther that

contains two pairs of pollinia attached to a single viscidia. Most coralroots self-pollinate; but some have colorful flowers and a spur-like nectary termed a mentum, and may be insect-pollinated as well. The column extends above the lip and positions pollinia for attachment to the upper thorax of insects as they exit the flower.

***Cypripedium* (Lady's slipper)**

Lady's slipper orchids are well known representatives of the Orchidaceae. They are characterized by showy inflated lips that are the largest of the native orchid flowers in Alaska. There are about 30 *Cypripedium* species in the northern Hemisphere, with eleven in North America, including three in Southeast Alaska. Pollinators are often bees, which are attracted by food deception to enter the lip through a large dorsal opening. One sterile anther, the staminode, is positioned over the lip and diverts pollinators first toward the stigma, and then toward one of two fertile anthers located above an exit hole on either side of the lip. Unlike most orchids, lady's slippers usually retain their pollinia, allowing a smear of pollen to be transferred to the upper thorax of pollinators as they exit the lip. Upon entering a new flower, pollen are deposited on the stigma before encountering the pollinia.

***Goodyera* (Rattlesnake plantain)**

At least 25 *Goodyera* species occur throughout the world. Four species occur in North America, where they are usually referred to as rattlesnake plantain orchids. All have small white flowers and ever-green foliage; many spread by rhizomes. At least one species occurs in Southeast Alaska. Nectar is provided at the base of the lip. The anther contains two pairs of pollinia with a single viscidia. The pollinia are positioned above the lip and are attached to the tongues of pollinators. When flowers first open, the column directs pollinators to the pollinia, and prevents contact with the stigma. Pollination occurs as pollinators bearing pollinia visit older flowers in which the column has exposed the stigma.

***Listera* (Twayblade)**

Listera is a worldwide genus of at least 25 species. Eight species occur in the U.S. and Canada, and at least four occur in Southeast Alaska. Twayblade applies to the usual presence of a single pair of leaves positioned partway up the stem. These small orchids are among the most difficult to find and identify. Some species are reported to produce small amounts of nectar. They are pollinated by a wide variety of small insects that land on the lip. The anther contains a single pair of pollinia, which are positioned above the base of the lip. A glue droplet is affixed to the pollinator, after which the pollinia are immediately glued to the insect. *Neottia* Guett. has been accepted by many authors as the correct name for this genus.

***Malaxis* (Adder's mouth)**

The genus *Malaxis* includes about 200 species that are distributed worldwide. Nine species and varieties occur in the U.S., two of which occur in Southeast Alaska. The flowers and entire plants of this genus are often quite small and difficult to locate. Both of the Alaskan species have non-resupinate flowers resulting from a 360-degree twist of the pedicel. A viscid glue binds two pollinia and serves to attach them to the pollinator. The Alaskan species may be pollinated by fungus gnats and small flies. However, their pollination biology is poorly understood.

***Piperia* (Piperia)**

The *Piperia* orchids comprise at least 10 species, most of which are restricted to western North America. The taxonomy of this genus is complex and has had multiple revisions. Most recently it has been re-combined with *Platanthera*. Alaska *Piperia* species have two basal leaves that disappear as plants flower, small flowers with similar petals and sepals, and short nectar spurs. Two pollinia are positioned on either side of the nectar spur entrance for attachment to the eyes or tongues of pollinators by viscidia. Two *Piperia* species occur in Southeast Alaska,

one of which was elevated to species status in 1990. Both species are apparently insect-pollinated, but little specific information is available on their pollination biology.

***Plantanthera* (Rein orchid)**

The rein orchids are the largest genus in Alaska. About 200 species occur worldwide, with 20 species in the U.S. and seven species in Southeast Alaska. The North American species represent a complex group in which species radiation has occurred in relation to pollinator size, with the length of the nectar spur usually corresponding to the length of the tongue of the pollinator. The larger species tend to have showy lips and large, fragrant inflorescences that combine to attract pollinators. Pollinaria are positioned on either side of the nectar spur entrance and adhere to the tongues or eyes of pollinators. After removal, the caudicle rotates forward, positioning the pollinium for contact with the stigma. The timing of this rotation appears to correspond to the movement of pollinators, and is more rapid for types of insects that quickly move to another plant. Included in this genus are several green-flowered species that often hybridize with other species and seem to defy proper identification.

***Spiranthes* (Ladies' tresses)**

Spiranthes is a large and confusing genus, with about 40 species in the Americas, 20 species in the U.S. and Canada, and one in Alaska. The North American species also have undergone revision and description of several new species. Ladies' tresses have tight inflorescences of white flowers, are so named because the spiral arrangement of flowers resembles braided hair. Nectar is provided at the base of the lip. A pair of pollinia are attached to a single viscidia, which is positioned above the lip and attached to the tongue of pollinators, which are primarily bees. As in *Goodyera*, flowers first mature the anthers, and then stigmas, beginning at the lower-most flowers in the inflorescence. Some *Spiranthes* species mature unfertilized ovaries into seeds.

Fairy Slipper (*Calypso bulbosa* (Linnaeus) Oakes)

The fairy slipper orchid is the most captivating of our native orchids. John Muir called it the “Hider of the North”, and had a spiritual awakening after seeing it. A single leaf appears in fall and remains green through the winter and spring, disappearing by early summer. Flowering occurs in early spring, with inflorescences of 1-2 flowers reaching up to 22 cm in height. Flowers are showy, with pink to lavender sepals and petals and a white to lavender lip that extends into a solid colored or spotted apron. Lips are less than 2 cm long, and with a yellow or white beard. Pollinators (bees) are attracted by food deception, and seed pods are rarely produced. Two varieties occur in North America.



The eastern fairy-slipper (*Calypso bulbosa*, var. *americana* (R. Brown) Luer), has a spotted lip with a yellow beard, and a solid white to lavender apron.



The western-fairy-slipper (*Calypso bulbosa* var. *occidentalis* (Holtzman) B. Boivin), has a spotted lip with a white beard, and a lavender-spotted apron.

Distribution of *Calypso bulbosa* varieties and forms

Var. *americana* occurs across northern North America west to Alaska. It ranges south in Alaska to Glacier Bay and the Chilkat Valley, where it has been found under lodgepole pine and at forest edges. It also extends south into Lynn Canal.

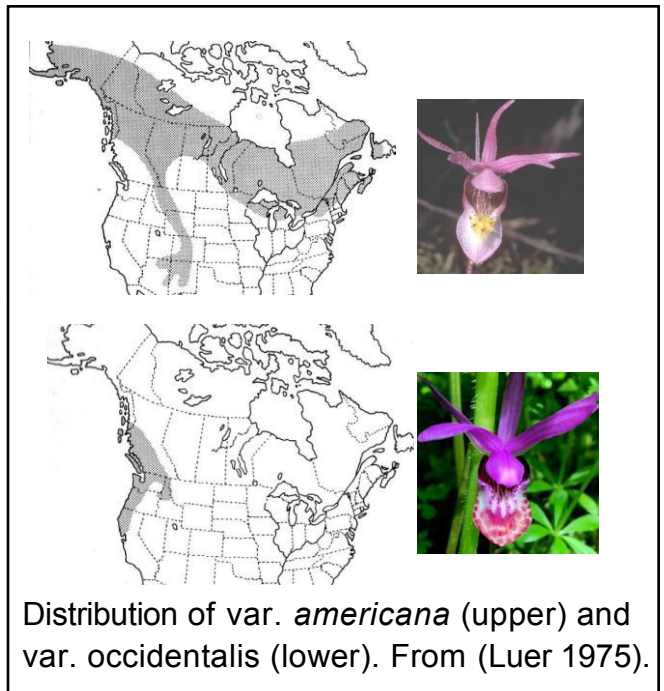
Var. *occidentalis* occurs along the Pacific Northwest coast. It ranges north into Southeast Alaska as far as Lynn Canal, where it occurs on small islands under Sitka spruce. These habitats may be moderated by the marine environment, and are also free of deer, which might eat the winter-green leaves of *Calypso*.

The ranges of these varieties overlap in Lynn Canal. This is one of only a few areas where both varieties occur.

Color variation is common in *Calypso*. Variety *americana* forma *rosea* has a solid lavender apron, and forma *albiflora* has a white flower. In var. *occidentalis*, forma *nivea* has a white flower. The two varieties also hybridize when their distributions overlap, producing *Calypso bulbosa* x *kostiukiae*.

Reproduction

Seed pod production is rare in *Calypso* because it lacks a food reward. It attracts newly emerged naïve bees that shift to other plant species that provide food.



Calypso bulbosa var. *americana* forma *rosea*.

Bracted (frog) Orchid (*Coeloglossum viride* (Linnaeus) Hartman)



Northern bracted orchid in alpine vegetation.



Long-bracted orchid in forest.

The bracted orchid has been segregated into two varieties that differ in size and habitat. Some authorities suggest that they should not be recognized because they represent extremes of morphological variation within the species. Nevertheless, they appear to occupy different habitats in North America.

The northern bracted orchid (var. *viride* (Linnaeus) Hartman) tends to be smaller and restricted to alpine or tundra habitats of North America and Europe. In the Juneau area, it occurs in alpine above 2000 ft (600 m) elevation. The long-bracted orchid (var. *virescens* (Muhlenberg) Luer) tends to be larger, with longer bracts, and is said to occur in shaded forest habitat. It occurs across North America south to the Midwest, and in Asia but not in Europe. In Southeast Alaska, it appears to be present in the Glacier Bay area, as well as in black cottonwood-spruce forest along the Chilkat River and near Juneau. More work is needed to understand the distribution and habitat of this variety in Southeast Alaska.

Bracted Orchid



Northern bracted orchid inflorescence.

The northern bracted variety flowers in late spring in alpine habitat. The compact inflorescence has short bracts and reaches 6-15 cm high. The long-bracted variety flowers in late spring at low elevations. The elongated inflorescence has longer bracts and reaches 20-80 cm high.

Both varieties have similar green flowers with 6-7.5 mm long lips that are notched at the tip, and short (2-3 mm) nectar spurs. Darwin and others suggest that a secondary nectary located at the base of the lip acts to direct pollinators toward the nectar spur and pollinia. Beetles, wasps, and ants pollinate this species in Europe. However, it is thought to self-pollinate in North America, where field studies are needed.



Long-bracted orchid inflorescence.



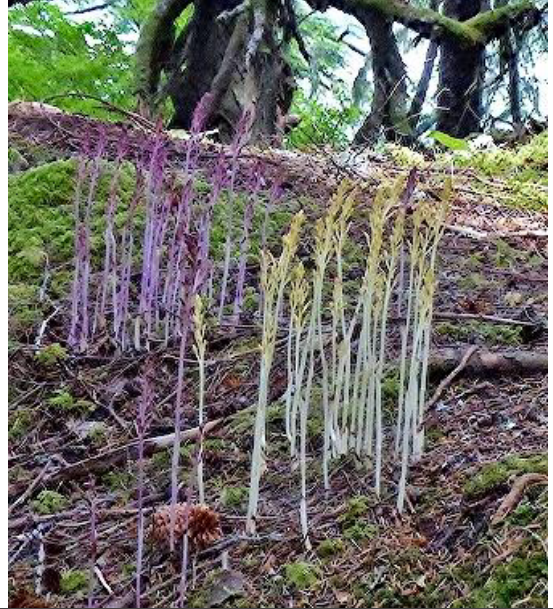
Bracted orchid flower and lip.

Western Coralroot (*Corallorhiza mertensiana* Bongard)

The western coralroot occurs from the Pacific Northwest east to western Montana. It reaches its northern range limit in Southeast Alaska, where it has been frequently collected. This species often grows in near-coastal forests, where it roots in partially decomposed conifer needles. It is dependent upon mycorrhizae for nutrients and is thought to specialize on *Russula* mushrooms. It was formerly classified as a variety of the spotted coralroot (*C. maculata*), but it is now considered distinct from this species.

The western coralroot often grows with the giant rattlesnake plantain and the northwestern twayblade orchids, and may occur with the eastern and western fairy slippers.

This coralroot flowers in early summer, with stalks up to 60 cm high. Plants usually have a dark purple stem and purple-spotted lips. Pigment-free forms are common, and range from pale yellow to white, but may retain color on lips.



A coralroot colony with mixed color forms.

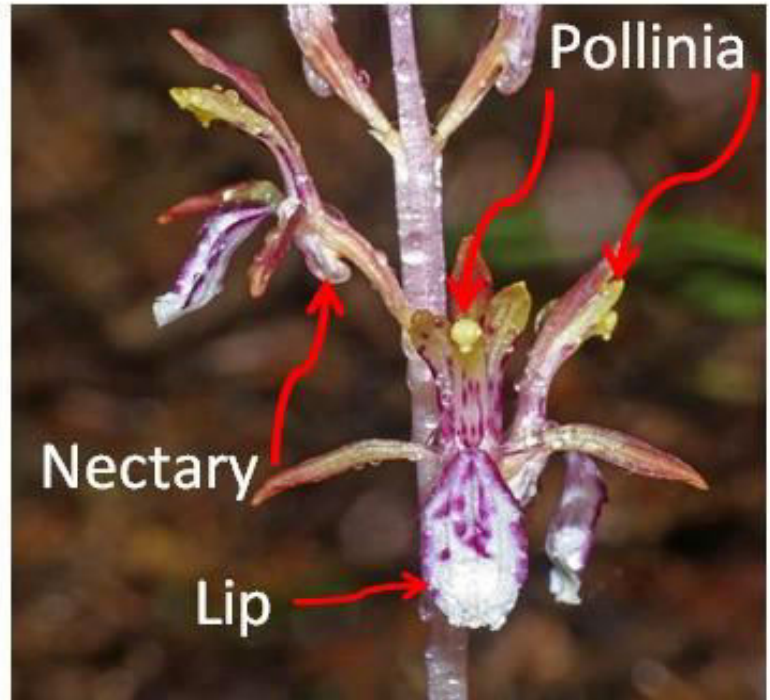


Pale and normal forms of the western coralroot.

Western Coralroot

The western coralroot has relatively large flowers with a showy lip about 7 mm long. It also appears to have a nectar spur that is the largest of all coralroots. It is also capable of developing a large floral display from multiple inflorescences, which might serve to attract insect pollinators. These floral characters suggest a large investment toward insect pollination.

In a northern California study, the closely related spotted coralroot had over 50% self pollination, but was also pollinated by dance flies. However, no information is available on the pollination system of the western coralroot, and we have observed no insect visitation to this species. The large flower size and position of the pollinia above the lip suggest that insects larger than dance flies could pollinate this species.



Floral anatomy of the western coralroot.

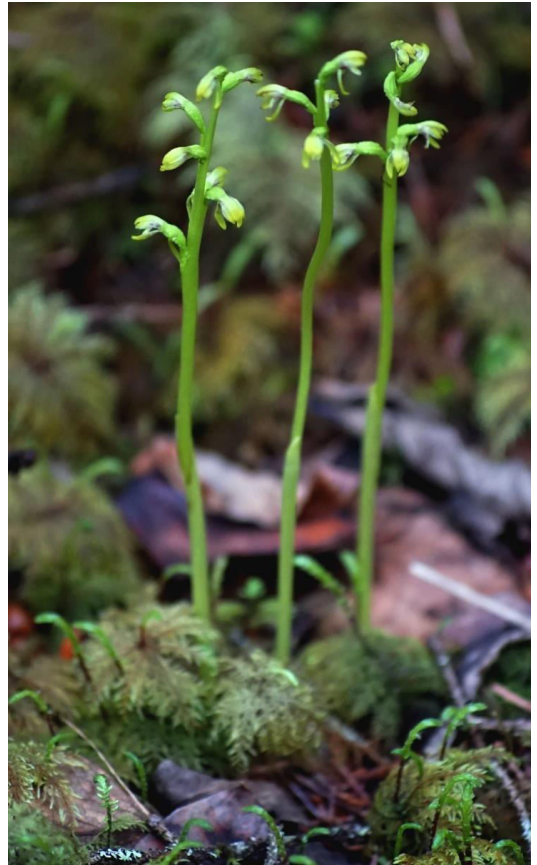


Floral display of the western coralroot.

Early Coralroot (*Corallorhiza trifida* Chatelain)

The early coralroot occurs from Alaska east across Canada and the northern US, as well as in northern Europe. There are a few records for this coralroot in the northern third of Southeast Alaska. It has been found at Glacier Bay, and is locally abundant in coastal forests near Juneau. It also occurs in recently established forest near the Mendenhall Glacier. In these habitats it has been found in association with the blunt-leaved orchid. It also occurs on islands with the western fairy slipper and the northwestern twayblade orchids.

Although this coralroot lacks leaves, it is capable of conducting photosynthesis in its green stem, through which it supplements fungal resources. Mycorrhizal fungi have been found connecting this orchid with living trees. It begins to flower in late spring, reaching up to 35 cm high with up to 20 flowers. Plants and flowers are green to yellow-green. The lip is white with red spots and about 3.25 mm long.



Early coralroot flowering stems.



Early coralroot inflorescence.

Early Coralroot

This coralroot is usually reported to self-pollinate. However, the red spots near the base of the lip and column of the early coralroot may serve to guide pollinators. The sequence below shows a dance fly entering an early coralroot flower, and after having exited the flower with orchid pollinia attached to its dorsal thorax. By visiting another plant, the dance fly could provide cross-pollination.



Color pattern at the base of the lip and column of the early coralroot.



Dance fly entering early coralroot flower and exiting with pollinia on its dorsal thorax.

Lady's Slipper (*Cypripedium* Linnaeus) species



Cypripedium montanum
Douglas ex Lindley.
Mountain lady's slipper.



Cypripedium parviflorum
Salisbury var. *pubescens*.
Yellow lady's slipper.



Cypripedium passerinum
Richmond. Sparrows' egg
lady's slipper.

Lady's slippers tend to be rare in Southeast Alaska. The mountain lady's slipper occurs in the Pacific Northwest. It occupies the widest range of habitats and light conditions in Southeast Alaska, including forests, alkaline bogs, and alpine meadows at Glacier Bay, in the Chilkat Valley, and on Prince of Wales and Etolin islands. The yellow lady's slipper occurs across North America. In Southeast Alaska, it has been found in three localities, occurring in beach meadows and in alkaline bogs. The sparrow's egg lady's slipper has a boreal distribution across North America. It is also known from three localities in Southeast Alaska, occurring on river gravel bars and in beach meadows and bogs. Populations of these species are small, and many are threatened by human impacts.

Lady's slipper orchids are conspicuous and showy. Their flowering stems range from 15 to 70 cm high, and have 1-3 flowers with lips from 1.5-3 cm long. Food deception is used to attract pollinators, which tend to be bees or wasps. However, the sparrow's egg lady's slipper usually self-pollinates. Unlike other native Alaskan orchids, entire pollinia are not transported by insects. Rather, masses of pollen grains are removed from the pollinia as the insect exits the flower.

Giant Rattlesnake Plantain Orchid (*Goodyera oblongifolia* Rafinesque)

This widespread species occurs eastward from Alaska across Canada and south in mountains to Mexico. It reaches its northern range limit at Yakutat, but appears to be absent from southern Southeast Alaska. It usually prefers coastal spruce-hemlock forests, where it roots in partially decomposed conifer needles. However, it also occurs with lodgepole pine on steep slopes along the Chilkat River. It often occurs with the western coralroot orchid, and has been found with both varieties of the fairy slipper.

This orchid has thick evergreen leaves with distinctive white and often reticulated venation. The leaves form rosettes that are connected by rhizomes into clones. It is one of two late-blooming orchids, flowering in late summer at the same time as the hooded ladies' tresses. It produces a one-sided spike up to 45 cm high with 5-70 small white flowers. The lips are less than 4 mm long. Rosettes are reported to die after flowering.



Giant rattlesnake plantain inflorescence.



Clone of rosettes connected by rhizomes.



Reticulation venation pattern.

Giant Rattlesnake Plantain Orchid

This orchid is reported to be pollinated by bees, and to have low rates of seed pod formation. We have not observed pollinators, which probably would be late-emerging male bees. In support of other studies, we found that only 35% of flowers formed seed pods in one area. Vegetative spread may be an alternative to low seed set, and could contribute to formation of clones in this species. This process might also replace rosettes, which reportedly die after flowering.

We observed a second flowering of plants with short inflorescences, which extended into early fall. No pollinators nor seed pods were observed on these plants, and it is unknown if their flowering rosettes died. However, numerous geranium plume moths (*Amblyptilia pica*, Pterophoridae) visited and removed nectar from these plants. Plume moths over-winter as adults and may depend upon such nectar resources.

Note: The lesser rattlesnake plantain (*Goodyera repens* (Linnaeus) R. Brown) may occur in Southeast Alaska. Canadian collections of this species from the Stikine River and Haines Junction are near the Alaska border, and suitable habitat may extend into Southeast Alaska. As the name implies, this species is smaller than *Goodyera oblongifoia*.



Leaves and inflorescence of a late-flowering plant.



Geranium plume moths obtaining nectar from a late-flowering plant.



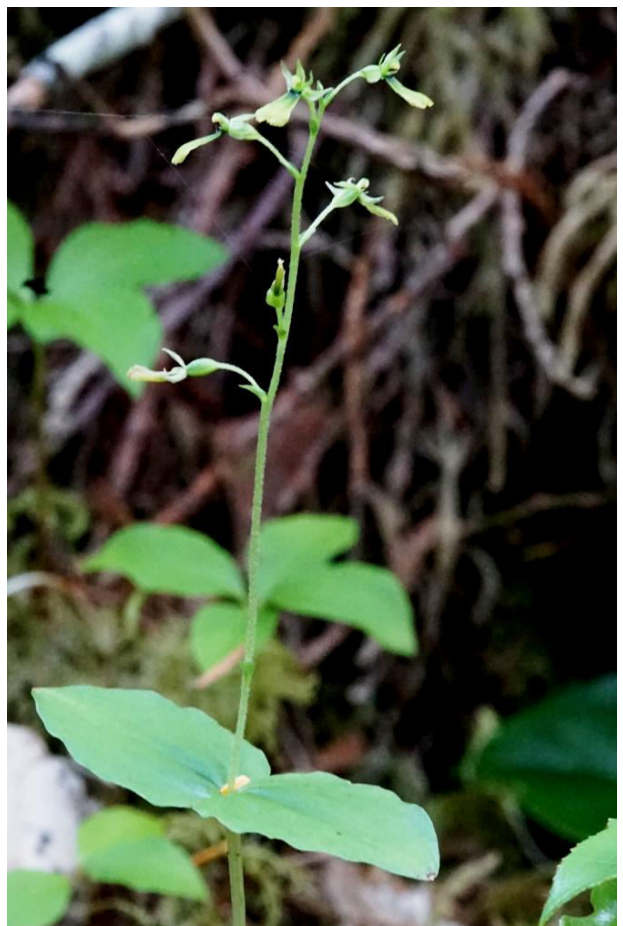
Flowers and leaves of the lesser rattlesnake plantain. Photo: Aaron Baldwin.

Northwestern Twayblade (*Listera banksiana* Lindley)

An older name for this species is *Listera caurina* Piper. A synonym is *Neottia banksiana* (Lind.) Rchb. f. As its common name indicates, the northwestern twayblade is restricted in distribution to the Pacific Northwest, where it extends north to the Kenai peninsula. In Southeast Alaska, this orchid often occurs in shaded coastal Sitka spruce-western hemlock forests. It is usually uncommon, occurring as an isolated plant or in small groups. It may occur with the heart-leaved twayblade, or with the western fairy slipper, giant rattlesnake orchid. It also occurs with the round-leaved orchid in western red cedar-Sitka spruce forests.



A large northwestern twayblade growing in coastal spruce-hemlock forest.



A sparsely flowered plant in coastal red cedar-hemlock forest.

Northwestern Twayblade

As with other twayblades, only two leaves are present, and are paired on the stem above the base of the plant. Flowering occurs in late spring. Inflorescences reach 30 cm high, with up to 20 small green flowers with a lip about 5.5 mm long.

Little information is available on pollination of this species. The lip and column are intermediate in size between the smaller heart-leaved twayblade and the larger northern and broad-lipped twayblades. This suggests adaptation to larger pollinators than the fungus gnats and small flies that pollinate the heart-leaved twayblade. The arching column in this species suggests that pollinia are attached to the upper thorax of pollinators.

Production of seed pods appears to be frequent in this species. Flowers persist through the summer on developing seed pods.



Northwestern twayblade flowers have a broad lip that is notched at the tip.



Partially dried lips persisting on developing seed pods of the northwestern twayblade.

Northern Twayblade (*Listera borealis*) Morong



Northern twayblade flowers and leaves.

Broad-lipped twayblade (*Listera convallarioides*) (Swartz) Nuttall



Broad-lipped twayblade flowers and leaves.

Photo source: <http://nativeorchidsofthepacificnorthwest.blogspot.com/>

The northern twayblade (synonym: *Neottia borealis* (Morong) Szlach.) occurs across Canada and central Alaska. In Southeast Alaska, it is known only from near the Yukon border. The broad-lipped twayblade (synonym: *Neottia convallarioides* (Sw.) Rich.) occurs in the southern Pacific Northwest and the eastern Great Lakes and Canada. It is absent from the northern third of Southeast Alaska, but occurs southward in spruce and black cottonwood forests, meadows, and beach fringes. Both species may reach 20-30 high cm with 20 flowers, and lips 10mm long. No information is available on pollination of either species. Their comparatively large flowers with broad lips and arching columns suggest adaptation to much larger insects than pollinators of other twayblades in Southeast Alaska.

Western Heart-leaved Twayblade (*Listera cordata* (Linnaeus) R. Brown)



A colony of flowering and non-flowering heartleaved twayblades in spruce-hemlock forest.

A synonym for this species is *Neottia cordata* (L.) Rich. Plants in Northwest Alaska are var. *nephrophylla*. This variety occurs from the Aleutian Islands east across Alaska, Canada, and the northern U.S., and south in mountains and coastal forests of the Pacific Northwest. A red-flowered form (*rubescens*) often co-occurs with green-flowered plants. Variety *cordata*, which is slightly smaller, apparently does not occur in our area.

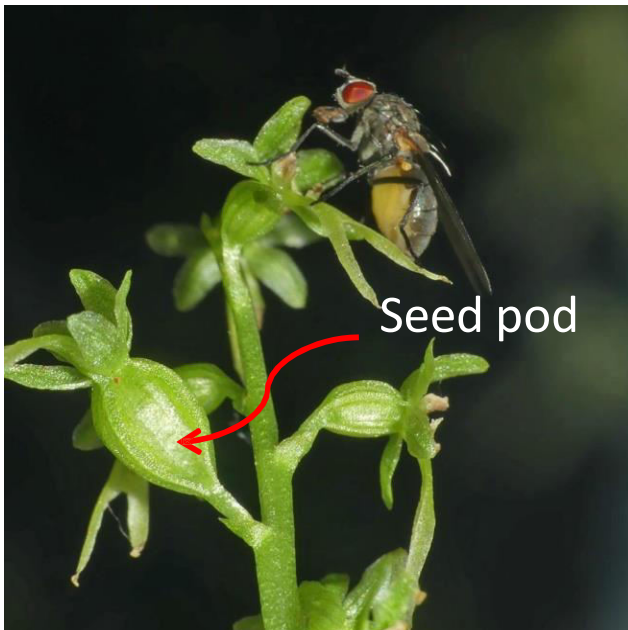
This species occurs in small to large colonies, often in thick moss, in heavily shaded coastal and riparian forests. Leaves of non-flowering plants are often present among flowering plants. This is our smallest forest orchid; the inflorescence reaches up to 30 cm high and has 5-25 green or red flowers. It often occurs with the giant rattlesnake orchid, and may occur with the less common northwestern twayblade orchid.

Western Heart-leaved Twayblade

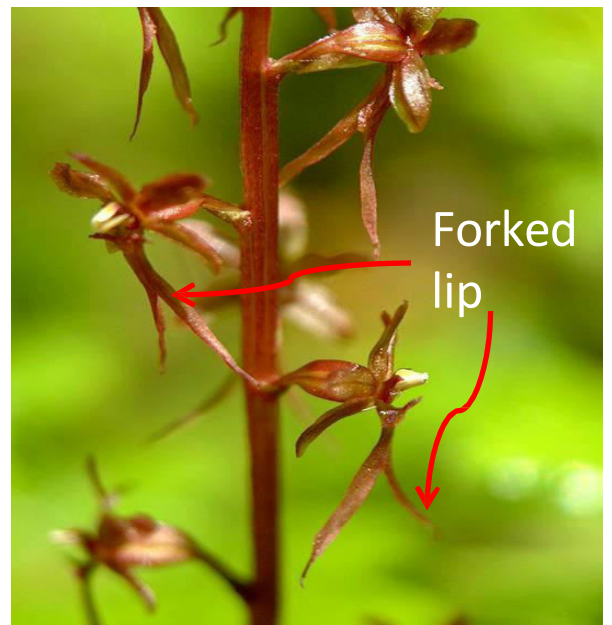
This orchid emerges in spring and begins flowering almost immediately. Flowers are quite small; the forked lip is about 5 mm long. Insect pollination is required to produce seed. The primary pollinators are reported to be fungus gnats, which are attracted by a fetid odor. However, a small amount of nectar is also produced and may attract other pollinators. As in other twayblades, a touch-sensitive trigger hair releases a quick-drying glue onto the visiting insect. This is immediately followed by release and attachment of pollinia to the insect via the glue. Flowers are retained on developing seed pods through the summer.



Fungus gnats are reported pollinators.



Green-flowered form of the heart-leaved twayblade.



Red-flowered form of the heart-leaved twayblade.

Two-leaved (Aleutian) Adder's mouth (*Malaxis diphyllus* Chamisso)

This adder's mouth species is also called *Malaxis monophyllos* (Linnaeus) Schwartz var. *diphyllus* (Chamisso) Luer. It was described from Unalaska, and was originally thought to be restricted to the Aleutian Islands and Eurasia. It is now known to occur in Southeast Alaska and British Columbia. Habitats include unshaded shallow soil pockets on sea cliffs and rocks near saltwater, as well as beach meadows, muskeg, and sub-alpine slopes. This species usually has two leaves and non-resupinate flowers. Plants with single leaves may be confused with the white adder's mouth, *Malaxis monophyllos* var. *brachypoda* (Gray) Morris & Ames, which has resupinate flowers, and may not occur in Southeast Alaska.



Flowering adder's mouth on a sea cliff slope.



Flowering adder's mouth in a sub-alpine meadow.



Adders' mouth with lupine in a soil pocket on a sea cliff.

Two-leaved Adder's Moth

Flowering occurs in late spring with 30-100 yellow-green flowers in a tight inflorescence that may reach 30 cm high. Flowers are quite small; the lip is about 2 mm long. Flowers in Southeast Alaska are non-resupinate due to a full 360-degree twist, which can be observed with a hand lens. Little information is available on pollination. Insects are thought to be required for cross-pollination. In Europe, the white adder's mouth reportedly has a fungus-like smell and is apparently pollinated by fungus gnats. Pollinia are attached to insects by a viscid glue to which pollinia are first attached.



Inflorescences can have up to 100 flowers.



Flowers of are non-resupinate because of a 360 degree rotation.

Bog Adder's Mouth (*Malaxis paludosa* (Linnaeus) Swartz)

The bog adder's mouth occurs across northern North America as well as Europe and Asia, where it is usually found in sphagnum bogs. It is one of Southeast Alaska's smallest and rarest orchids and has been found in bogs, fens, and muskeg on Chichagof, Douglas, and Prince of Wales islands as well as the Alaska mainland.

This orchid is reported to root in mosses above the soil layer, and therefore to have an epiphytic habit. However, a single plant found growing in muskeg on Douglas Island was rooted in peat soil. It is the smallest native orchid, and flowering stems may be less than 5 cm high. This small stature may contribute to infrequent sightings and reports of its rarity.



Leaves and lower inflorescence of the bog adder's mouth, growing in muskeg.

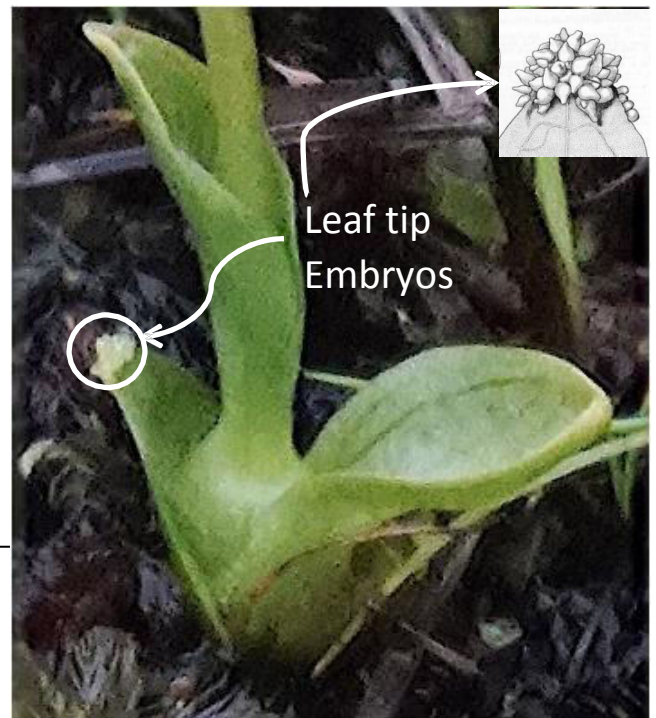
Bog Adder's Mouth

The bog adder's mouth flowers in early summer. Its flowers are the smallest of all North American native orchids. The lip is about 1.5 mm long, with dark and light green stripes. The lip is uppermost (non-resupinate) due to a full 360-degree twist. Darwin observed that once the seed pod is matured it is rotated back to the original position. Insect pollination is required for production of seed pods. A viscid glue binds the pollinia, and then serves to attach pollinia to visiting insects. In one study, flowers were found to have a sweet odor, and were pollinated by fungus gnats.

This is the only native orchid that produces leaf-tip embryos, or bulblets, which disperse and generate new plants. After dispersal, the embryos must establish a fungal mycorrhizae for further development.



The lip is non-resupinate due to a 360 degree rotation of the flower.



Leaf-tip embryos on the bog adder's mouth. Drawing from Figure 1.2 in: Taylor, R.L. 1967. Canadian Journal of Botany 45:1553-1556.

**White Piperia (*Piperia candida*)
Rand. Morgan & Ackerman**



White piperia flowers.

Alaska Piperia (*Piperia unalascensis* (Sprengle) Rydberg)



Alaska piperia flowers.

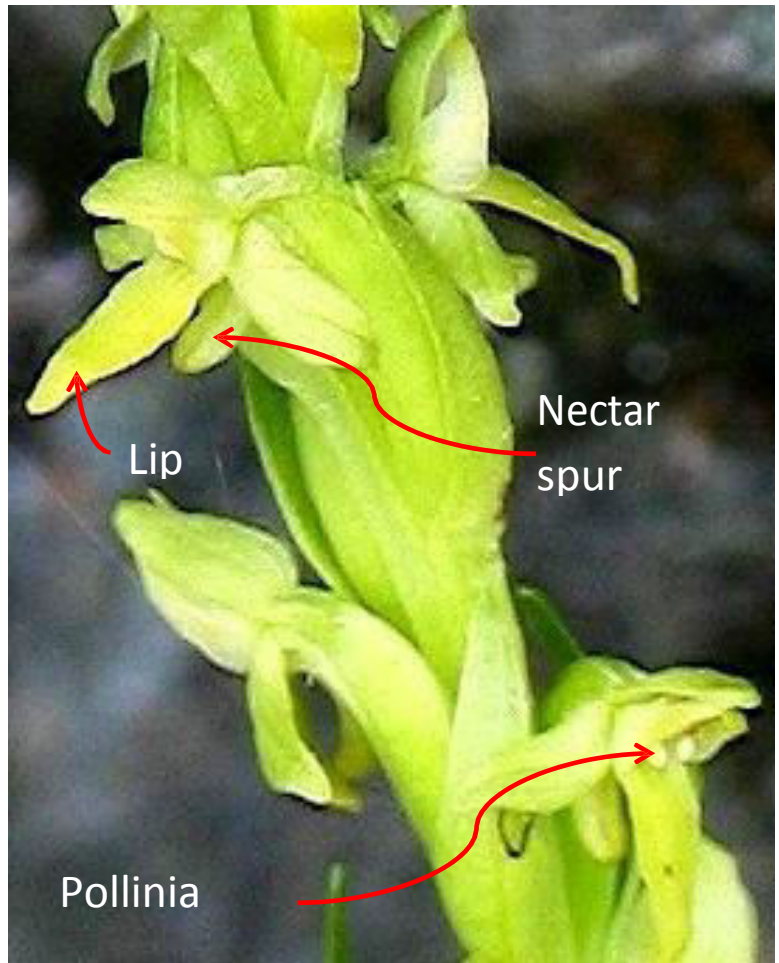
Photo source: <http://nativeorchidsofthepacificnorthwest.blogspot.com/>

These uncommon species occur throughout the Pacific Northwest. The white piperia is known from Baranof and Prince of Wales islands. A synonym for this species is *Platanthera ephemeranthera* R.M. Bateman. The Alaska piperia has been found on the mainland at Glacier Bay and in the Chilkat Vally, and on larger islands to the south. Though widespread, it appears to be rare. A synonym for this species is *Platanthera unalascensis* (Spreng.) Kurtz. Plants of both species may reach 70 cm high with 20-80 small flowers and 2.5-3.5 mm long lips and nectar spurs. The white flowers of the white piperia suggest that it could be moth pollinated, Little other information is available on their pollination.

Northern Green Bog Orchid (*Platanthera aquilonis* Sheviak)



Northern green bog orchid near the Herbert Glacier.



Northern green bog orchid floral anatomy.

This widespread northern orchid was recently separated from *Platanthera hyperborea* (Linnaeus) Lindley), which is now known to be a European species. It probably occurs in much of northern Southeast Alaska, but records are scarce due in part to difficulty in identification. It is reported from beaches and meadows at Glacier Bay and along the Chilkat River, and may occur near glaciers further south. It flowers in early summer, producing a spike that can reach 60 cm, with up to 45 yellow-green flowers. A key character may be the nectar spur (3.5 mm) shorter than the lip (> 4 mm long). This species normally self-pollinates, but insect-pollinated populations are encountered. It crosses with *Platanthera dilatata* to produce the hybrid species *Platanthera huronensis* (see below).

Chamisso's Orchid (*Platanthera chorisiana* (Chamisso) Reichenbach



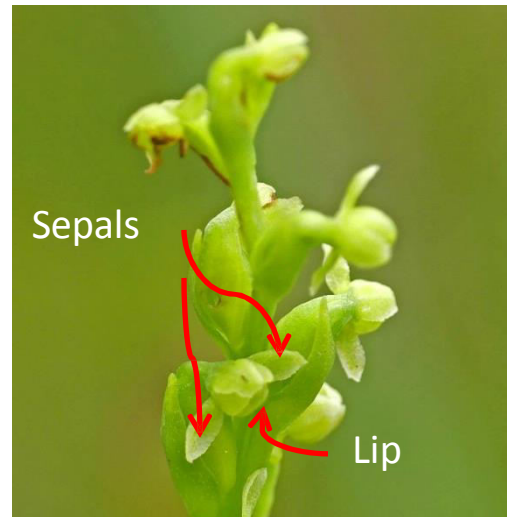
Chamisso's orchid growth form.

This obscure orchid occurs from Japan across the Aleutian Islands and south to British Columbia. It probably occurs throughout Southeast Alaska, and was first collected on Douglas Island in 1891 by Grace Cooley. It often grows in sphagnum-covered muskeg or similar bog-like environments, but it has been collected from other habitats, including alpine meadows. Flowers appear in early summer, with an inflorescence of 5-20 small light green flowers reaching up to 20 cm high.

Chamisso's Orchid

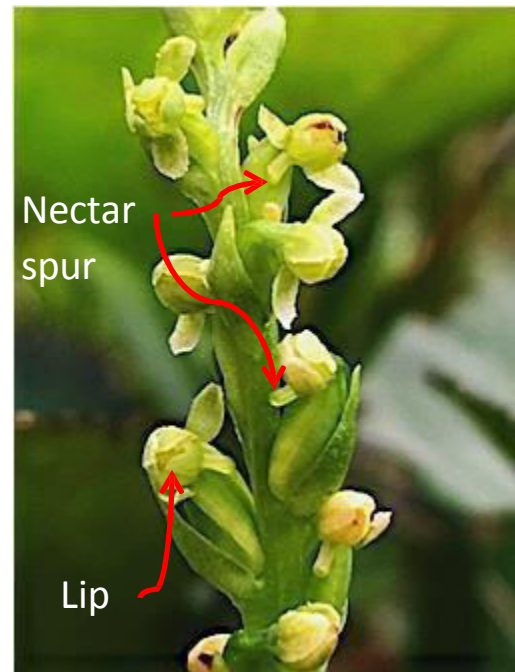


Chamisso's orchid inflorescence.



Sepals

Lip



Nectar spur

Lip

Chamisso's orchid floral anatomy.

This is the smallest native rein orchid in Southeast Alaska. The lip is about 2 mm long, and the spur about 1 mm. Flowers are often partially rotated and appear closed except for the flared lateral sepals. It is pollinated by beetles in Japan, which corresponds to its short nectar spur. It was found to be self-pollinating in Canada, and insect pollination has not been reported for North America.

White Bog Orchid (*Platanthera dilatata* (Pursh) Lindley)



White bog orchid in glacial meadow.

This orchid is widespread across northern North America. It is Southeast Alaska's most highly visible orchid, occurring from sea level to alpine in meadows, fens and muskeg. It also colonizes roadsides and ditches. Flowering occurs in early summer, with an inflorescence of showy white flowers that may reach 1 m high. It has been segregated into three varieties with long (var. *leucostachys* (Lindley) Leur), intermediate (var. *dilatata* (Pursh) Lindley), and short (var. *albiflora* (Chamisso) Ledebout) nectar spurs thought to correspond to pollinators with different tongue lengths. Variety *albiflora* is thought to predominate in Alaska, but all three varieties may be present in Southeast Alaska.

White Bog Orchid variation

Plants occurring in lower-elevation meadows and fens near Juneau have flowers with 7-9 mm long lips and 9-12 mm long nectar spurs, and may represent selection toward var. *leucostachys*. This variety also has been observed in alpine meadows elsewhere in Southeast Alaska. The bedstraw hawkmoth was recorded pollinating these plants. An owlet moth (Noctuidae) was also recorded carrying a pollinium. Other moths or bees whose tongues cannot access nectar may be ineffective pollinators.



Large-flowered white bog orchid in glacial meadow habitat.



Bedstraw hawkmoth (*Sphinx gallii*)
pollinating *Platanthera dilatata*.

Video links:

Sphingidae - <https://vimeo.com/280467246>

Noctuidae - <https://vimeo.com/279993651>

Plants occurring in muskeg near Juneau and Ketchikan have smaller flowers with 6-7 mm long lips and 7-10 mm long nectar spurs, and may represent selection toward var. *dilatata*.



Small-flowered white bog orchid in muskeg habitat.

Green Bog Orchid (*Platanthera huronensis* (Nuttall) Lindley)

This robust orchid is understood to have arisen from hybridization between two other *Platanthera* species (*P. aquilonis* x *P. dilatata*). It occurs across Alaska and northern North America. In Southeast Alaska it occurs on beach ridge meadows in Yakutat and in Glacier Bay, and in muskeg south to Baranof Island. It has been reported from the Juneau area, but this has not been verified.

The green bog orchid may reach up to a meter high, with 20-75 flowers. Lips and spurs are about 8 mm long, and flowers are reported to be fragrant. This species is also reported to have both self-pollinating and outcrossing races. In one study, it was a pollinator generalist, with bees, moths, and butterflies acting as pollinators.



Green bog orchid in beach meadow habitat.

Blunt-leaved Rein Orchid (*Platanthera obtusata* (Banks ex Pursh) Lindley)

The blunt-leaved orchid occurs across northern North America and Asia, and south in mountain regions of North America. It is represented by subspecies *obtusata* in North America. The Asian subspecies *oligantha* may occur in the Aleutian Islands. This orchid is found throughout most of Alaska, including north of the Arctic Circle, but it has been rarely collected in Southeast Alaska. Collections are known from beach meadow habitat in the Chilkat peninsula, coastal forest peninsulas and sea cliffs near Juneau, and in forest near the Mendenhall Glacier.



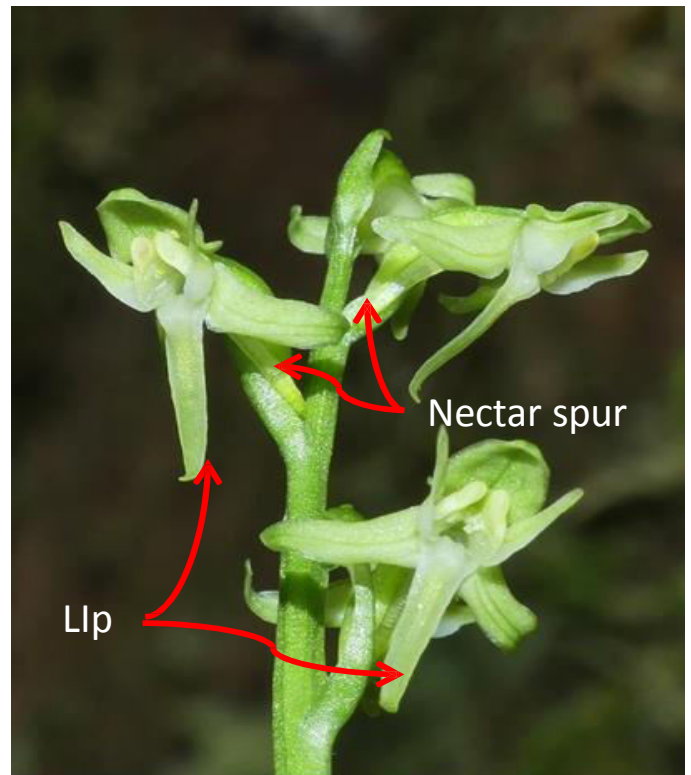
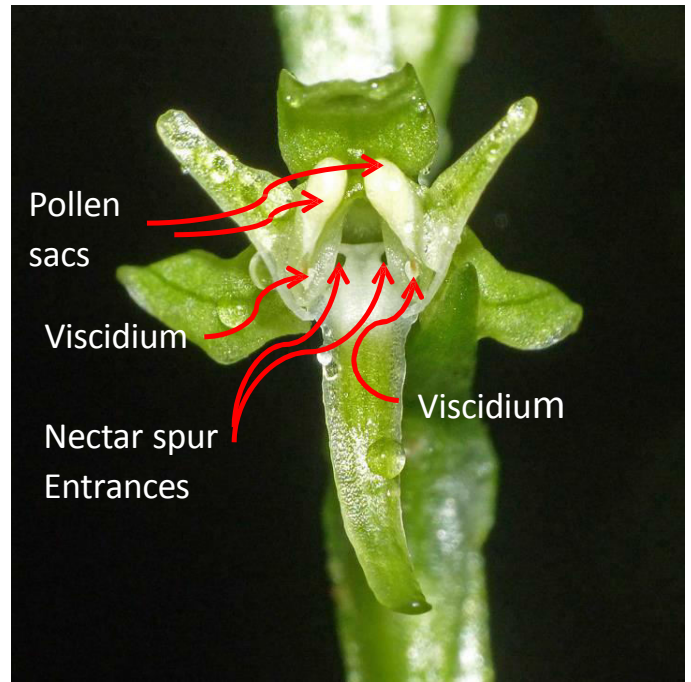
The single basal leaf and extended lip are distinguishing features of the blunt-leaved orchid.



Blunt-leaved orchid growing in a soil pocket of a sea cliff. A large population occurs in adjacent forest.

Blunt-leafed Rein Orchid

This orchid has a single blunt leaf and an inflorescence that may reach 35 cm high with up to 15 small, light green flowers. The lips and spurs may reach 8 mm long. The flowers of this species are adapted to pollination by mosquitoes. They release an odor similar to that of the human body (and presumably other mammals) that attracts mosquitoes. Unlike most rein orchids, there is no centrally located nectar spur entrance. Although the pollinaria are widely spaced, as if positioned for deposition on eyes of a quite large pollinator, small openings adjacent to each pollinarium force the insect to contact either viscidium as it feeds. We have seen dance flies visiting these flowers, and geometrid moths have been reported bearing pollinia.



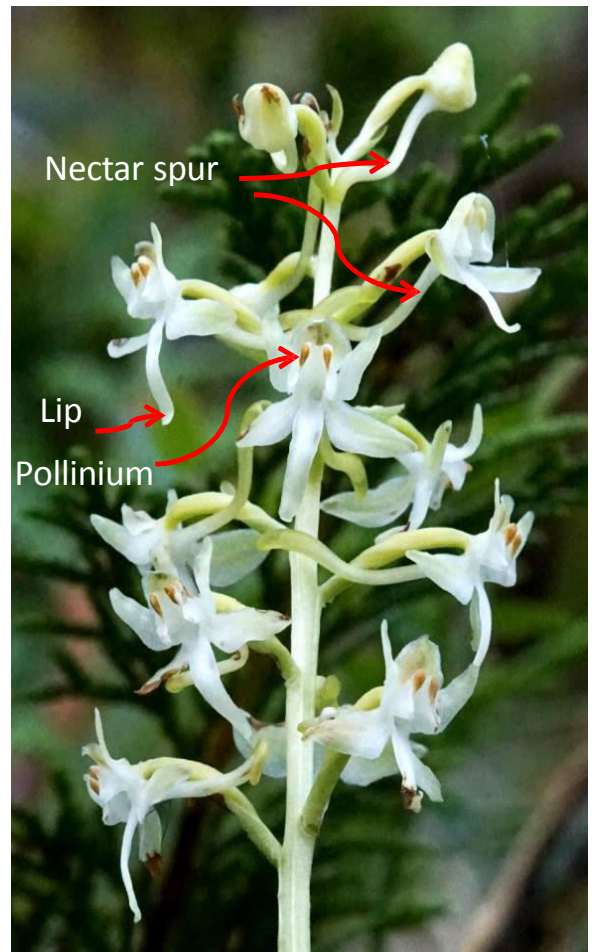
Floral anatomy of the blunt-leaved orchid.

Round-leaved Rein Orchid (*Platanthera orbiculata* (Pursh) Lindley)



Kris Larson

Round-leaved orchid in western red cedar forest.



Round-leaved orchid floral anatomy.

This distinctive orchid occurs from Southeast Alaska east across North America, with close relatives in Japan. In Southeast Alaska, it is associated with western red cedar forests on Prince of Wales Island and southward. It usually occurs in small isolated colonies.

North American plants are segregated into two varieties that differ in nectar spur length. The short-spurred variety (*var. orbiculata*) occurs in Alaska, and has the largest flowers of our native rein orchids. The inflorescence may reach 60 cm, with 8-14 long-lasting pale green to white flowers that are apparently pollinated by large moths. The nectar spur is about 2 cm long, and the widely spaced pollinia appear to be positioned for deposition on eyes of pollinators. Very little is known of its pollinators.

Slender Bog Orchid (*Platanthera stricta* Lindley)

This is a widespread and common rein orchid in wetlands of northwestern North America, extending west to the Aleutian Islands. It is quite frequent in open and partially shaded edges of muskeg in Southeast Alaska, and often occurs with skunk cabbage.

Flowering begins in late spring, with the dark- to pale-green flowers persisting into summer. Inflorescences may reach up to 1 m high with 10-50 flowers. Large plants may be so robust as to appear to be different species from smaller plants.



Large slender bog orchid plants at the edge of muskeg.

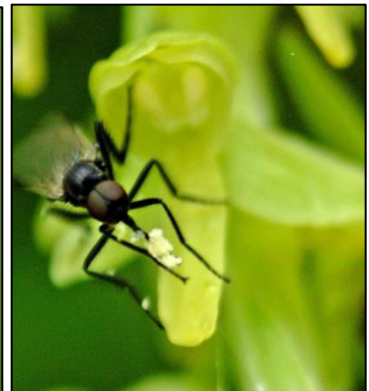
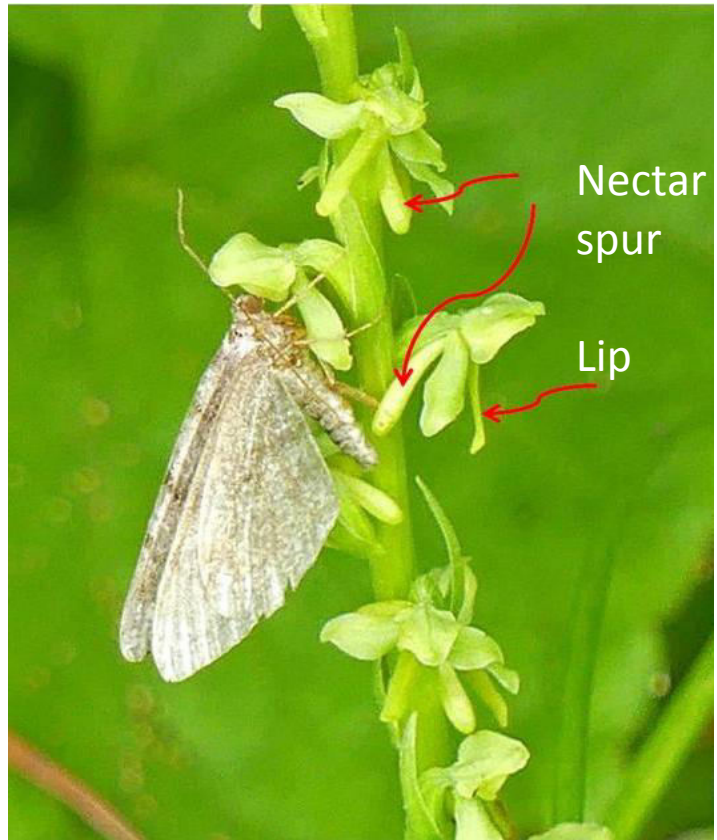


Slender bog orchids growing with skunk cabbage and deer cabbage.

Slender Bog Orchid



Inflorescences of slender bog orchid.



Floral anatomy and pollinators of the slender bog orchid. Upper: Geometrid moth, Lower: dance fly.

Flowers have with 4 mm long lips and a thick nectar spur of the same length. This species is a generalist with respect to pollinators, placing pollinia on the eyes of geometrid moths and on the tongues of bees and dance flies.

Hooded Ladies' Tresses (*Spiranthes romanzoffiana* Chamisso)

This ladies tresses is widespread in wetlands and grasslands across northern North America, and also occurs in the British Isles. In Southeast Alaska it is infrequent in muskeg and meadows, along lakeshores, rivers, and beaches. It also occurs in open woodlands and thickets.

This species appears to flower from early to late summer, depending upon location. It is often one of the last orchids to flower. It produces a spike of 10-60 white flowers that reaches up to 55 mm high. The name "ladies' tresses" refers to the spiral arrangement of flowers. "Hooded" refers to the closure of the top of the flower by the lateral petals and sepals.



Hooded ladies tresses In flooded meadow near the Mendenhall Glacier.



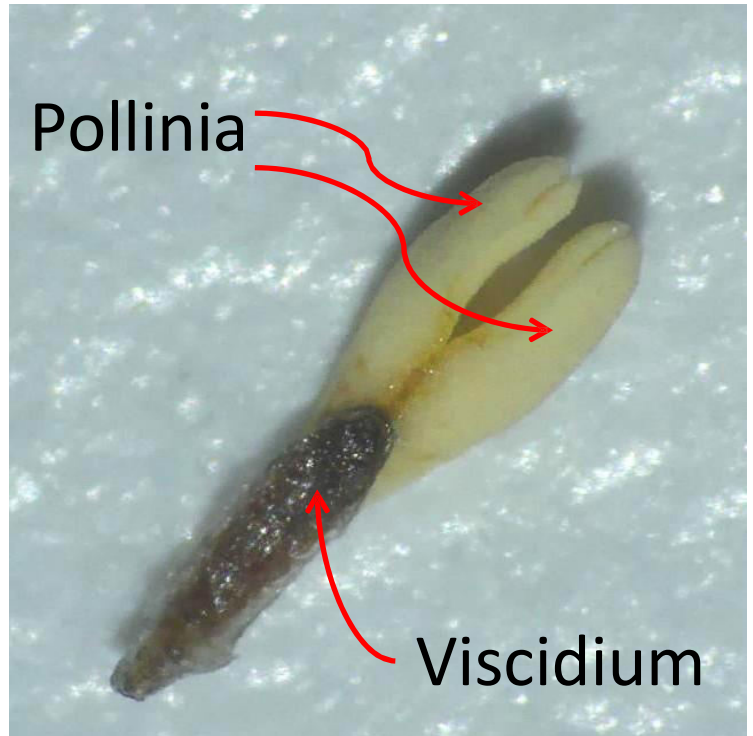
Hooded ladies tresses Inflorescences in muskeg.



Hooded ladies tresses inflorescences at woodland edge.

Hooded Ladies'-tresses

Hooded ladies' tresses flowers have 7.5 mm-long lips. The flowers are almond-scented and produce nectar at the base of the lip. Late-flowering plants are pollinated by male bees that usually emerge in August. The pollinium contains two pollen masses, and is attached to the base of the bee's tongue by an elongated viscidium. Pollination success in muskeg averaged about 80% of flowers forming seed pods. Flowering plants enforce outcrossing by first maturing pollinia, after which flowers become receptive to pollen deposition.



Pollinarium of hooded ladies tresses.



Black-tailed bumble bee pollinating hooded ladies' tresses.

Video link:
<https://vimeo.com/285643040>

References.

Argue, C.L. 2012. The pollination biology of North American Orchids: Volume 1. North of Florida and Mexico. Springer, New York, N.Y. (*Exhaustive review of species-level pollination biology*)

Argue, C.L. 2012. The pollination biology of North American Orchids: Volume 2. North of Florida and Mexico. Springer, New York, N.Y. (*Exhaustive review of species-level pollination biology*)

Brown, P.M., and S.F. Folsom. 2006. Wild Orchids of the Pacific Northwest and Canadian Rockies. The University Press of Florida. Gainesville, Florida. (*Includes coverage of Alaska; highly Recommended*)

Brown, P.M., and S.F. Folsom. 2003. Wild Orchids of North America, North of Mexico. The University Press of Florida. Gainesville Florida. (*All native orchids are treated*)

Coleman. R.A. 1995. The Wild Orchids of California. Cornell University Press. Ithaca, New York. (*Quite useful information from a nearby area*)

Dressler, R.L. 1981. The Orchids, Natural History and Classification. Harvard University Press. Cambridge, Mass. (*Academic, but useful information on orchid natural history*)

Darwin, C. 1862. The fertilization of Orchids by Insects. 1st edition. London. (*Revised in 1877; both versions have been reprinted. Good insight into Darwin's reasoning power*)

Luer, C.A. 1975. The Native Orchids of the United States and Canada Excluding Florida. New York Botanical Garden. Bronx, New York. (*A valuable, extensively detailed, and illustrated catalogue of native orchids; range maps for all species*)

van der Pijl, L. and C.H. Dodson. 1966. Orchid Flowers: Their Pollination and Evolution. University of Miami Press, Coral Gables Florida. (*Academic, but a quite useful well-illustrated reference for understanding orchid pollination*).

Swedell, W.P. 1999. Uncovering the Juneau Botanical Club's herbarium. Alaska State Museum Concepts, Technical Paper No.1. (*History of the Juneau Botanical Club plant studies*)

Szczawinski, A.F. 1959, The Orchids of British Columbia. British Columbia Provincial Museum Handbook No. 16. (*Small pamphlet, but useful information on distribution in an adjacent area*).

Internet Resources

Orchid taxonomic treatment in Flora North America

http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=1063_8

Integrated Taxonomic Information System. Authoritative taxonomic information on plants, animals, fungi, and microbes, includes currently accepted scientific names

<https://www.itis.gov/>

North American orchid conservation center

<https://serc.si.edu/research/projects/north-american-orchid-conservation-center>

Native orchid conference & journal

<http://www.nativeorchidconference.info/journal.html>

Photographs and discussion of Pacific Northwest orchids

<http://nativeorchidsofthepacificnorthwest.blogspot.com/>

Orchid recovery

<https://www.ic.edu/biology/orchidrecovery>

University of Alaska Fairbanks Herbarium and data base. Collection records, herbarium sheet photos, and interactive maps for Southeast Alaska plants. <https://www.uaf.edu/museum/collections/herb/>

Searchable through ARCTOS

(<http://arctos.database.museum/SpecimenSearch.cfm>)

Consortium of Pacific Northwest Herbaria. Searchable data base from 40 herbaria that cover the Pacific Northwest, including Alaska. Includes herbarium sheet photos and interactive maps.

<http://www.pnwherbaria.org/index.php>

Electronic atlas of the flora of British Columbia. Excellent photos and interactive distribution maps showing collection records; covers Southeast Alaska.

<http://ibis.geog.ubc.ca/biodiversity/eflora/>

Annotated species lists of vascular plants in Southeast Alaska. Includes 26 orchid species with links to photographs and weblinks.

http://wiki.seaknature.org/Vascular_Plants

Glossary (plural endings are in parentheses)

- anther** - part of the stamen producing pollen
- apron** – extension of the lip of *Calypso*
- anther cap** – caplike structure over pollinia
- anther sac** – saclike enclosure over pollinia
- arboreal** – living on trees
- autogamous** – capable of self-pollination
- basal leaf** – leaf appearing at the base of the plant stalk
- bract** – leaf-like structure below a flower; smaller than stems leaves.
- bulblet** - a small regenerative bulb that is dispersed from a plant
- caudicle** – extension of the pollinium that adheres to a pollinator
- chlorophyll** – green pigment essential for photosynthesis
- column** – structure in an orchid combining pistil and stamens
- cross-pollination** – transfer of pollen between plants
- dorsal** – upper side
- germination** – initiation of growth in seeds or pollen
- fen** – floating peatland with water flowing at the surface
- humus** – decomposed organic material
- inflorescence** – cluster of flowers
- labellum** – orchid lip
- lip** – modified orchid petal
- mentum** – spur-like projection from the base of the lip and sepals in coralroot orchids; apparently a nectar source
- monocot** – group of plants bearing a single embryonic leaf at germination
- morphology** – form and structure

muskeg – firm (non-floating) peatland

mycorrhiza(zae) – root connection between orchid and fungus

by which nutrients are exchanged

mycotropic – obtaining food from a mycorrhizal relationship

nomenclature – technical assignment of names

ovary – the part of the pistil containing seeds

pedicel – flower stalk above a bract

perennial – plant living multiple years

petal – one of three parts forming the inner whorl of an orchid flower

photosynthesis – production of carbohydrates by plants using light

energy, carbon dioxide, and water

pistil – seed-producing organ, part of the orchid column

protandrous – maturing of the anther before the stigma, prevents

self-pollination

pollen – anther- borne grains that contain male gametes, which

germinate on the flower stigma

pollinarium(ia) – pollinium and associated structures usually transported

by insects

pollinium(ia) – mass of pollen grains

resupinate – 180 degree twist in the ovary that positions the lip at the

lower side of the flower

rhizome – a horizontal, usually underground, stem, may generate a new

plant

riparian – along rivers, riverine

rosette – a circular arrangement of leaves, usually at the base of a stem

self-pollination – pollination of a plant by its own pollen grains,

opposite of outcrossing

sepal – one of the outer whorl of three flower parts that cover the petals in buds

sessile – lacking a stalk

spike - an inflorescence containing sessile flowers

stamen – pollen-producing part of a flower

staminode – a sterile stamen, in *Cypripedium* flowers.

stigma – the part of the pistil that receives pollen and provides a site for pollen germination

stipe – similar to a caudicle, bears viscidia

taxonomy – classification of species

terrestrial – living in soil or on the ground

tuber – thickened underground stem capable of generating new vegetative growth

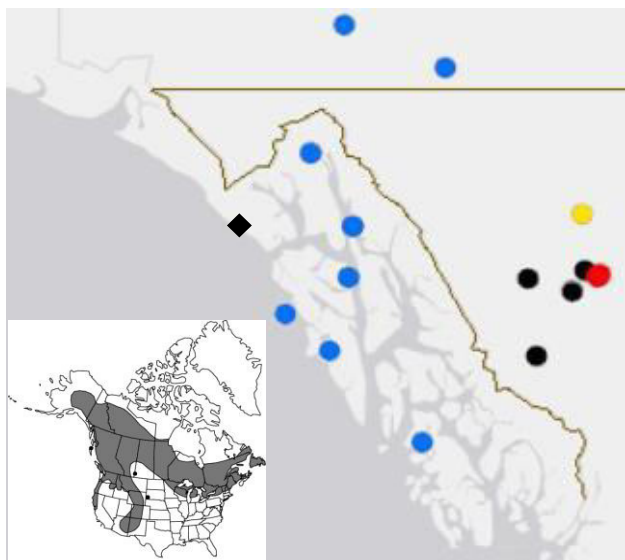
viscidium(ia) – sticky appendage of the caudicle or stipe that adheres to an insect pollinator

vegetation – the collective plant species growing in a given area.

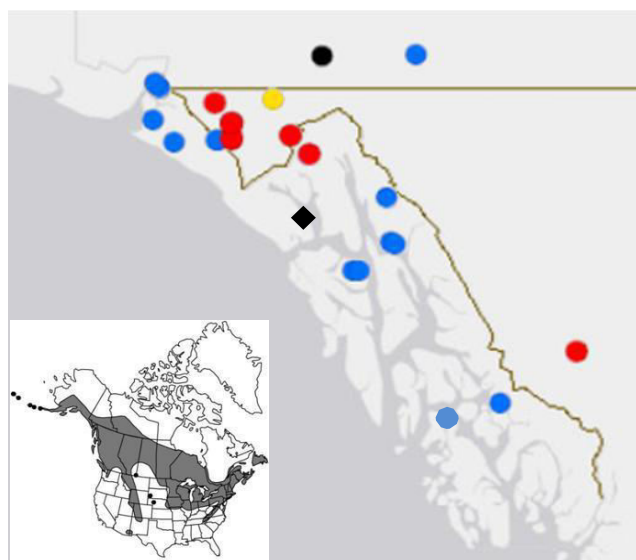
whorl – three or more equally spaced leaves at a stem node

Appendix I. Orchid species distribution in Southeast AK and adjacent areas. Base maps: Klinkenberg, B. (2018. Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Dep. Geog. Univ. of B.C., Vancouver). Inset maps: Flora of North America (www.eFloras.org) or Luer (1975) for *Malaxis paludosa*. Symbols represent locations derived from herbarium records, or observational records that include published or technical reports, or information from the authors:

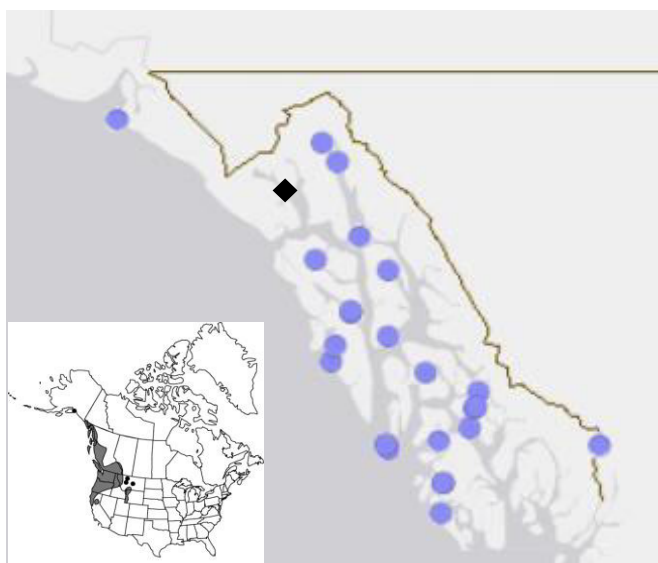
University of Alaska (●), University of British Columbia (●), Royal British Columbia Museum (●), Global Biodiversity Information Facility (●), Glacier Bay NP (◆), Alaska State Museum (◆), USFS Forestry Sciences Herbarium (◆), Observational (◆)



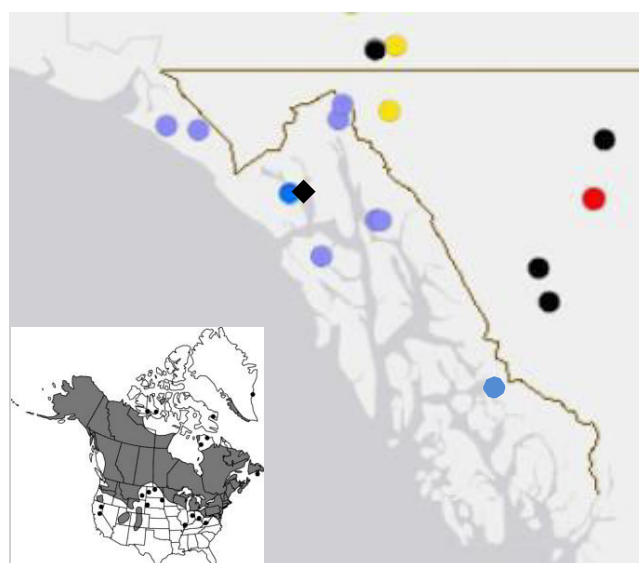
Calypso bulbosa



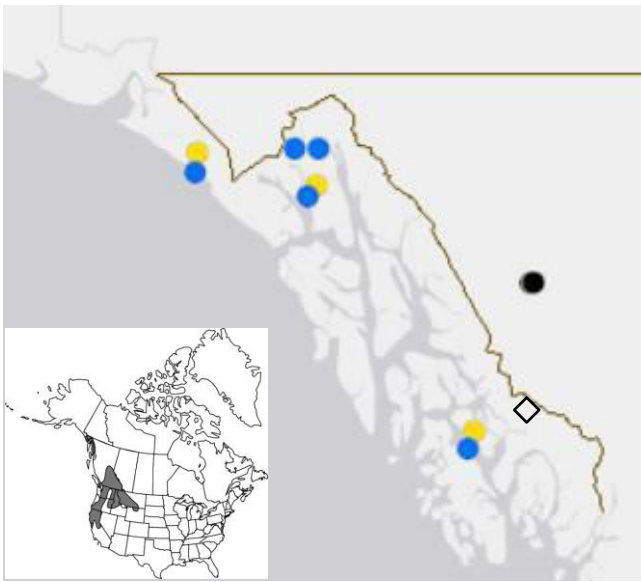
Coeloglossum viride



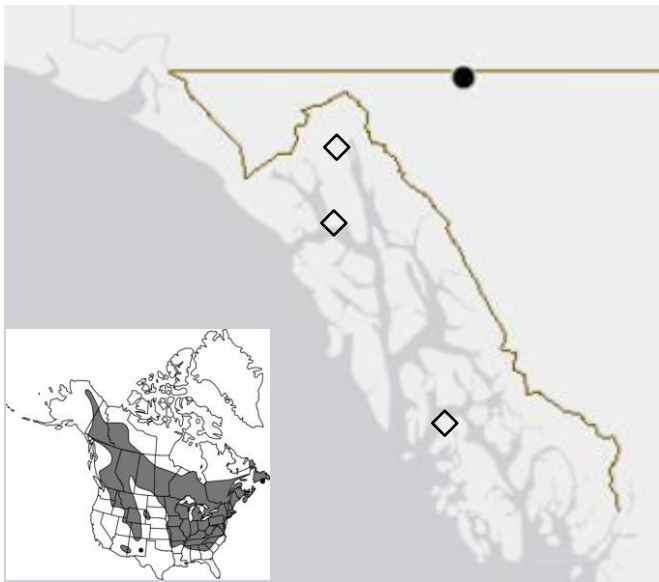
Corallorhiza mertensiana



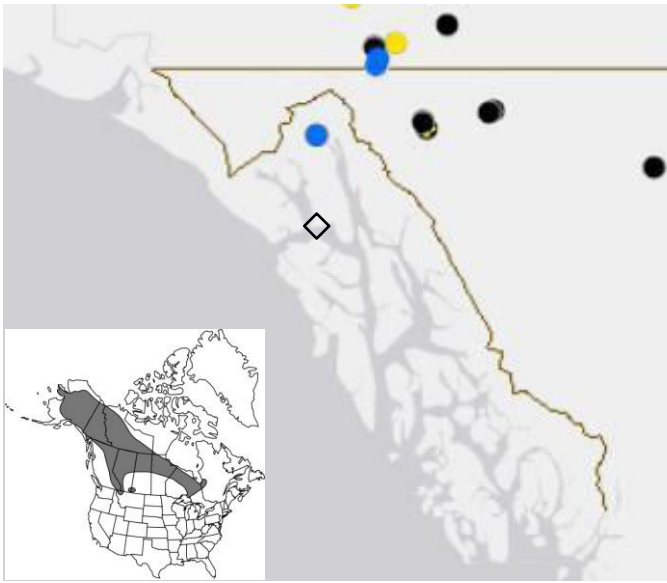
Corallorhiza trifida



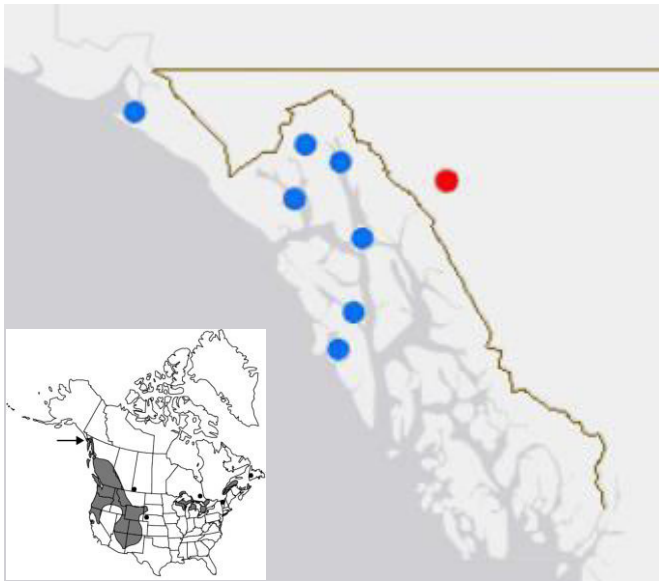
Cypripedium montanum



Cypripedium parviflorum var. *pubescens*



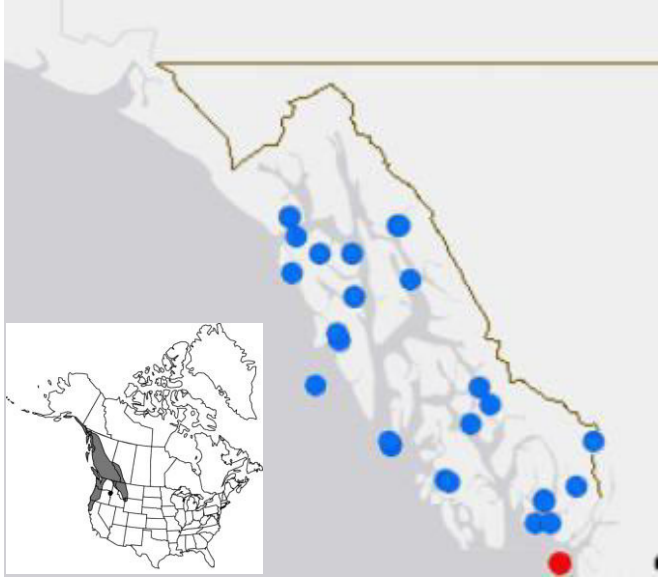
Cypripedium passerinum



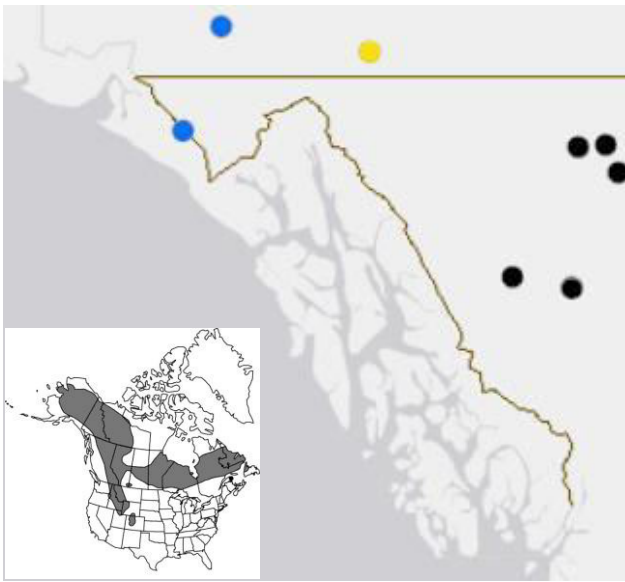
Goodyera oblongifolia



Goodyera repens



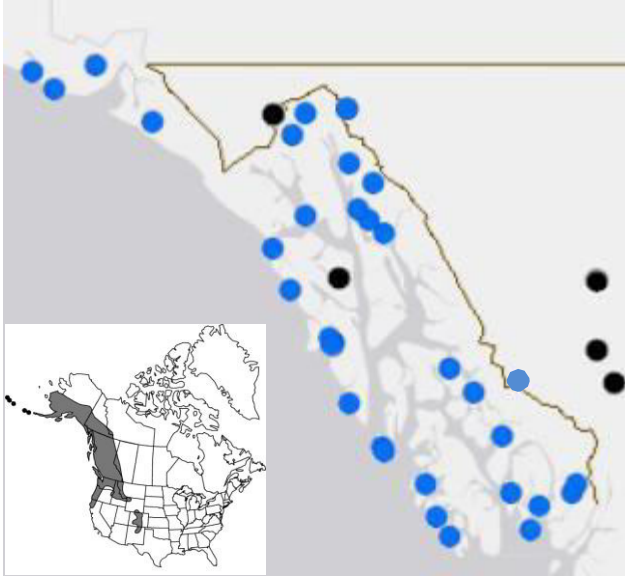
Listera banksiana



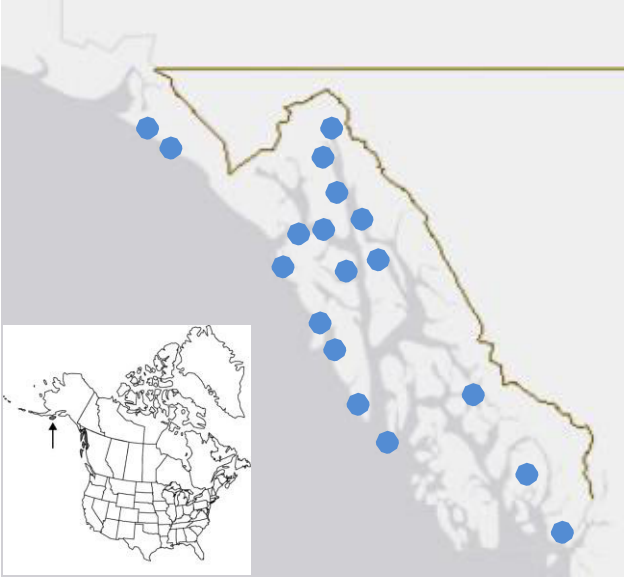
Listera borealis



Listera convallarioides



Listera cordata var. *nephrophylla*



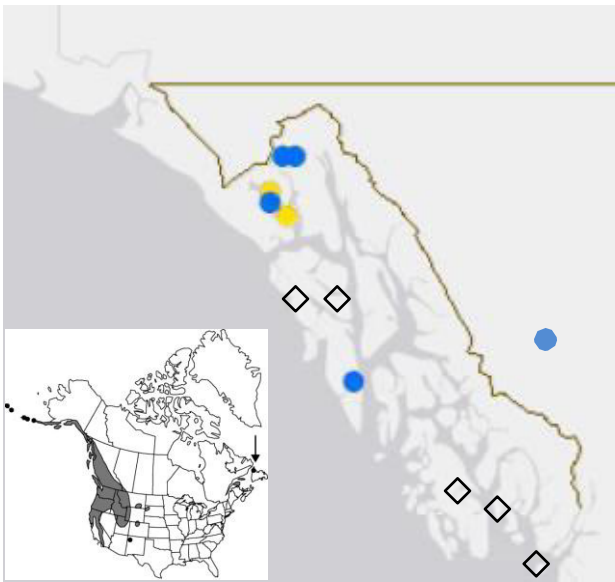
Malaxis diphyllus



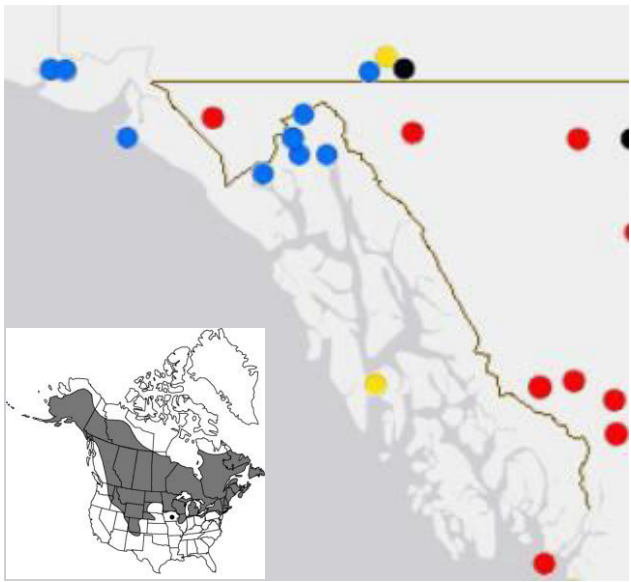
Malaxis paludosa



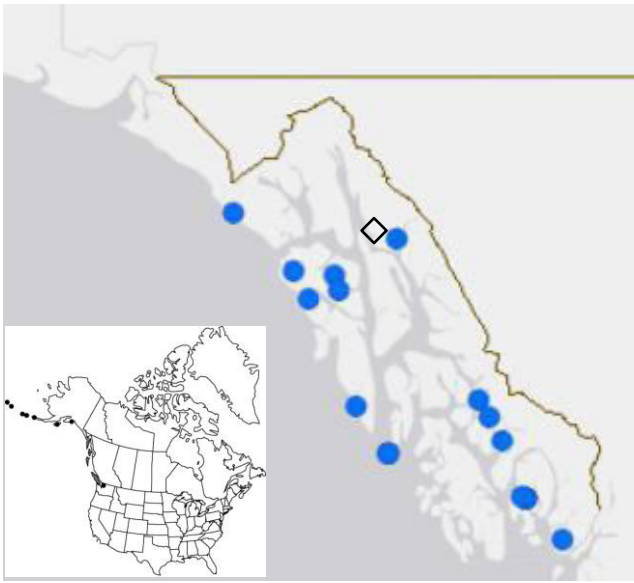
Piperia candida



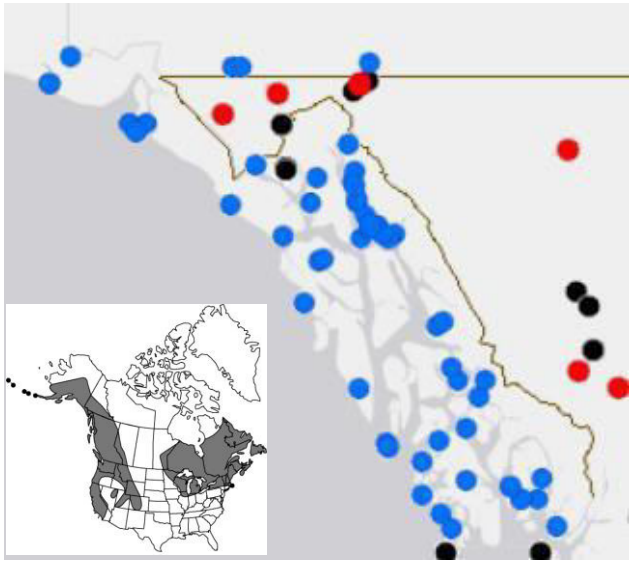
Piperia unalascensis



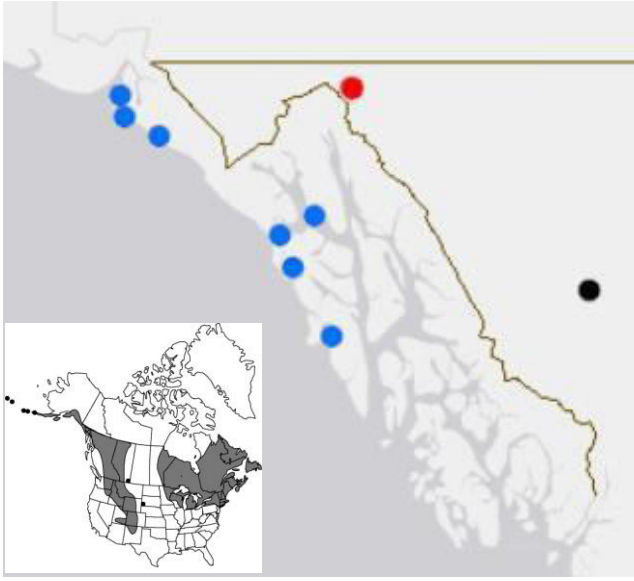
Platanthera aquiloinis



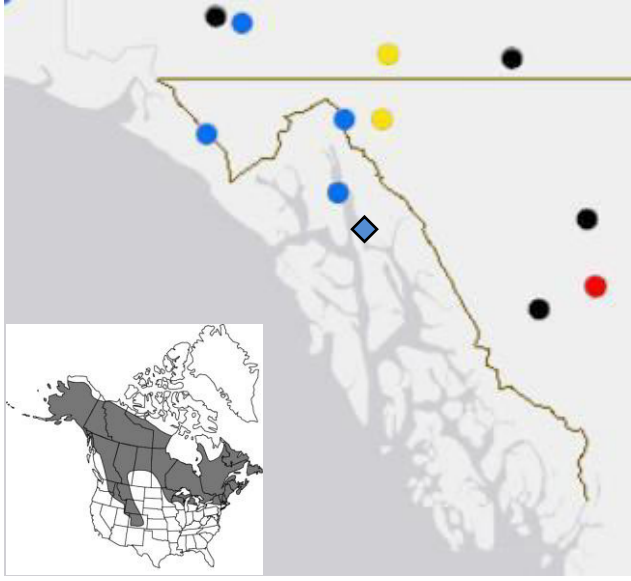
Platanthera chorisiana



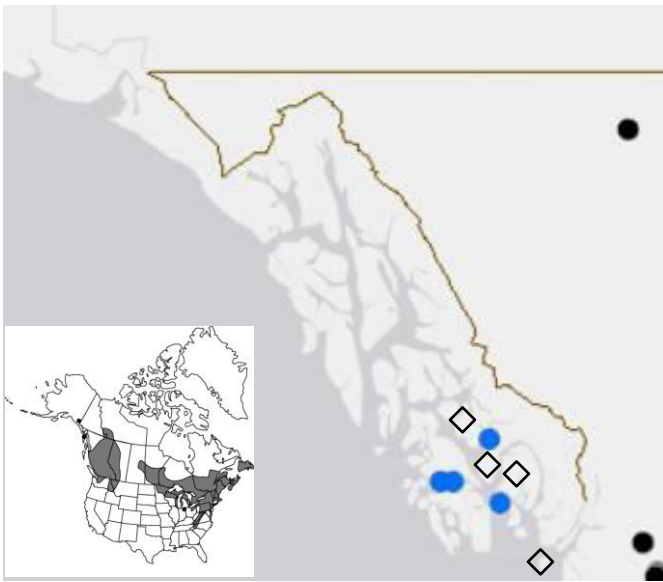
Platanthera dilatata



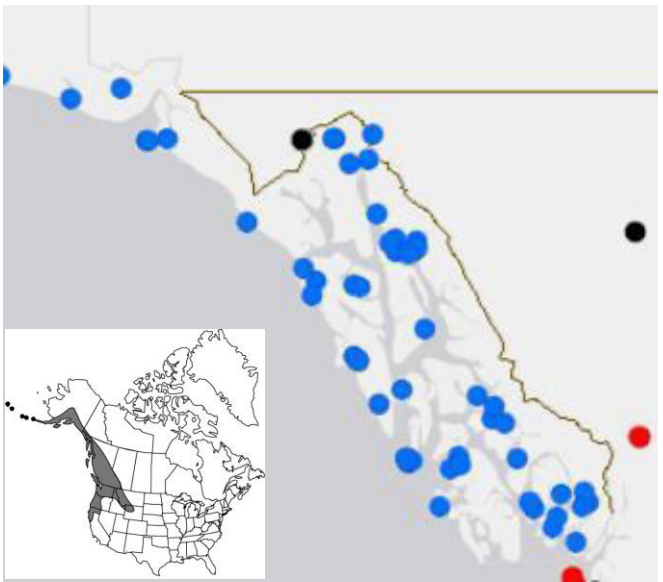
Platanthera huronensis



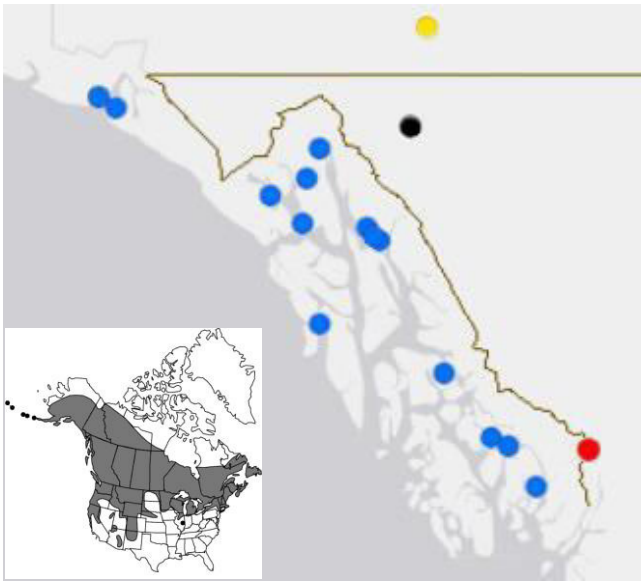
Platanthera obtusata



Platanthera orbiculata



Platanthera stricta



Spiranthes romanzoffiana