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Insect Visitors and Potential Pollinators of Lingonberries, *Vaccinium vitis-idaea* subsp. *minus*, in Subarctic Alaska

Acknowledgments

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Introduction

Lingonberries are the second most popular wild berry harvested in Alaska. They are harvested for personal use and for a small cottage industry marketing jams, jellies, teas, syrups and other products. Wild berry production fluctuates annually, possibly due to frost or rain during anthesis, disease, drought, animal or bird predation, lack of pollinators, and insufficient pollination. The management of pollinators is one method of increasing annual yields and promoting a consistent supply of berries. Although insects have been shown to be important in lingonberry pollination throughout the circumpolar North, native pollinators have not been identified on lingonberries in Alaska. The impact of introduced hives of honeybees and bumblebees on management of pollination in wild stands has not been investigated.

Objectives

The purpose of this project was to identify potential pollinators of lingonberries growing in wild stands and determine the impact of introduced bumblebees and honeybees on fruit set.

Beehive of introduced honeybees.

Insect Visitors

Methods

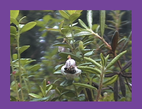
Flowers of lingonberries were observed and video taped at five locations in the Tanana River floodplain, Alaska in June and early July. Flowers were video taped intermittently throughout the flowering season including three, 24-hr tapings at three locations. Insect visitors were captured, identified and examined for pollen loads. Pollen from lingonberry and concurrently blooming species were identified and counted.

Results

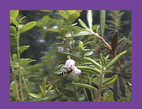
- Fourteen insects were identified as potential pollinators (Table 1).
- Species with more than 1000 pollen tetrads per insect included the introduced species: honeybee, *Apis mellifera* and bumblebee, *Bombus terrestris*. Native pollinators included the bumblebees *Bombus sylvicola* and *B. flavifrons flavifrons* as well as *Andrena* sp. and *Dialictus*? (Halictidae)
- Most insects foraged lingonberry flowers between 0500 (5 A.M.) and 1800 (6 P.M.) despite the nearly 24-hr daylight during anthesis (Table 2). The foraging time of the most important potential pollinators was 0800 – 1800 (8 A.M. – 6 P.M.)

Conclusion

Video and insect capture resulted in the identification of 14 possible pollinators for lingonberries. The greatest lingonberry pollen loads were recovered from several Bombus species indicating they may be useful in managing wild lingonberry stands by introducing hives to improve fruit set. Despite the nearly 24-hr daylengths in Alaska in late June, insects foraged lingonberry flowers during the period that would be considered daylight hours at lower latitudes (0500 - 1800 hr).



Beefly feeding at a flower



Small beefly feeding at a flower.

Wasp visiting a flower.

Table 1. Captured insects visitors on lingonberry, *Vaccinium vitis-idaea*, and the amount of recovered lingonberry pollen tetrads per insect

Forest type	Insect visitor	Pollen tetrads count per cm2
Closed hardwood-white spruce floodplain forest adjacent to cleared farm fields	Cimbicidae, *Trichosoma* sp.	0
	Vespidae, *Dolichovespula arenaria* (Fab.)	18
	Apidae, *Bombus flavifrons flavifrons* Cresson	>1000
	Apidae, *Apis mellifera* Linn.	217
	Apidae, *Apis mellifera* Linn.	4
	Apidae, *Apis mellifera* Linn.	>2000
	Andrenidae, *Andrena* sp.	>2000
	Andrenidae, *Andrena* sp.	798
	Halictidae, *Dialectus*?	137
	Halictidae, *Dialectus*?	1034
	Syrphidae, *Syrphus* sp.	7
	Apidae, *Psithyrus* sp.	4
Paper birch/aspen hardwood upland forest	Apidae, *Bombus terrestris* (L.)	>3000
	Syrphidae, *Syrphus* sp.	64
	Apidae, *Bombus frigidus* Smith	1
	Apidae *Bombus sandersoni* Franklin	775
	Apidae, *Bombus flavifrons flavifrons* Cresson	285
	Lepidoptera, Geometridae	0
Closed white spruce/hardwood upland forest	Apidae, *Bombus terrestris* (L.)	1606
	Geometridae, *Rheumaptera* sp.	0
	Apidae, *Bombus flavifrons flavifrons* Cresson	2
	Vespidae, *Doli chovespula norvegicoides* (Sladen)	5
	Vespidae, *Dolichovespula norvegicoides* (Sladen)	36
	Andrenidae, *Andrena* sp.	3
	Syrphidae, *Syrphus* sp.	7
	Syrphidae, *Melangyna* sp.	0
Alpine tundra	Apidae, *Bombus sylvicola* Kirby	1549

Table 2. Time of day for insect visitations to lingonberry flowers for four locations in the Tanana River Floodplain, Alaska sampled from 15 June to 3 July, 2001

Time	Insect visitors
Midnight - 02:00	none
02:00 - 04:00	none
04:00 - 06:00	none
06:00 - 08:00	Vespidae, *Dolichovespula arenaria* (Fab.) Vespidae, *Dolichovespula norvegicoides* (Sladen)
08:00 - 10:00	Apidae, *Apis mellifera* (L.) Vespidae, *Dolichovespula arenaria* (Fab.) Vespidae, *Dolichovespula norvegicoides* (Sladen) Andrenidae, *Andrena* sp. Syrphidae, *Syrphus* sp. Syrphidae, *Melangyna* sp. Apidae, *Bombus flavifrons flavifrons* Cresson Apidae, *Bombus* sp.
10:00 - Noon	Halictidae, *Dialectus*? Vespidae, *Dolichovespula arenaria* (Fab.) Vespidae, D*olichovespula norvegicoides* (Sladen) Andrenidae, *Andrena* sp. Cimbicidae Hymenoptera Apidae, *Bombus flavifrons flavifrons* Cresson Apidae, *Apis mellifera* (L.) Apidae, *Bombus terrestris* (L.) Apidae, *Bombus* sp. Geometridae, *Rheumaptera* sp.
noon - 14:00	Halictidae, *Dialectus*? O *chlerotatus* sp. Syrphidae, *Syrphus* sp. Apidae, *Psithyrus* sp. Apidae, *Bombus terrestris* (L.) Andrenidae, *Andrena* sp.
14:00 - 16:00	Apidae, *Apis mellifera* (L.) Andrenidae, *Andrena* sp. Halictidae, *Dialectus*? Apidae, *Bombus terrestris* (L.) Vespidae, *Dolichovespula arenaria* (Fab.) Syrphidae, *Syrphus* sp. Apidae, *Bombus sylvicola* Kirby
16:00 - 18:00	Apidae, *Bombus* sp. Geometridae, *Rheumaptera* sp. Syrphidae, *Melangyna* sp.
18:00 - 20:00	Halictidae, *Dialectus*?
20:00 - 22:00	none
22:00 - midnight	none

Introduced Honeybee and Bumblebee hives

Methods

Hives of bumblebees (*Bombus terrestris*) and honeybees (Carniolan strain) were placed at four locations in spruce-hardwood forests in the Tanana River Valley. Transects, 15 m to 150 m in length were established starting at the hive, two to four transects per hive. Flower buds were flagged at specific intervals ranging from 0.6 m to 15 m. The length of the transect and spacing between flags varied among sites depending on the size of the lingonberry population. Flowers and fruit were counted. Percent fruit set and seed number were correlated with distance from the hive. Data were analyzed by regression analysis and curve fitting to identify any relationship between distance from hive and fruit set.

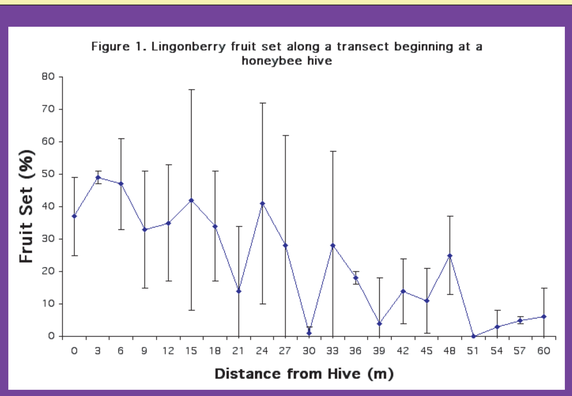
Results-honeybees

- No relationship was found between fruit set/filled seed count and distance from honeybee or bumblebee hives at all wild stands.
- Fruit set varied significantly along the transects regardless of orientation or site.

Conclusions

This experiment was based on the assumption that fruit set/seed number might improve with greater proximity to the hive. No such relationship was shown by the data. On the contrary, variability of fruit set was high along all transects. Several factors could explain the results. The assumption that proximity to the hive is correlated with pollination intensity could be incorrect. Lingonberry flowers were visited by bumblebees and honeybees at all sites as well as natural pollinators, and transects may have been too short to show relationships. Vegetation, tree cover and lingonberry abundance were not uniform along the transects. More flowers occurred in exposed, sunny sample areas than forested areas, possibly promoting higher visitation at exposed. Although the introduced honeybees and bumblebees were observed visiting the flowers, we did not demonstrate that introducing hives to wild stands had any influence on fruit set/seed number.

Figure 1. Lingonberry fruit set along a transect beginning at a honeybee hive



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