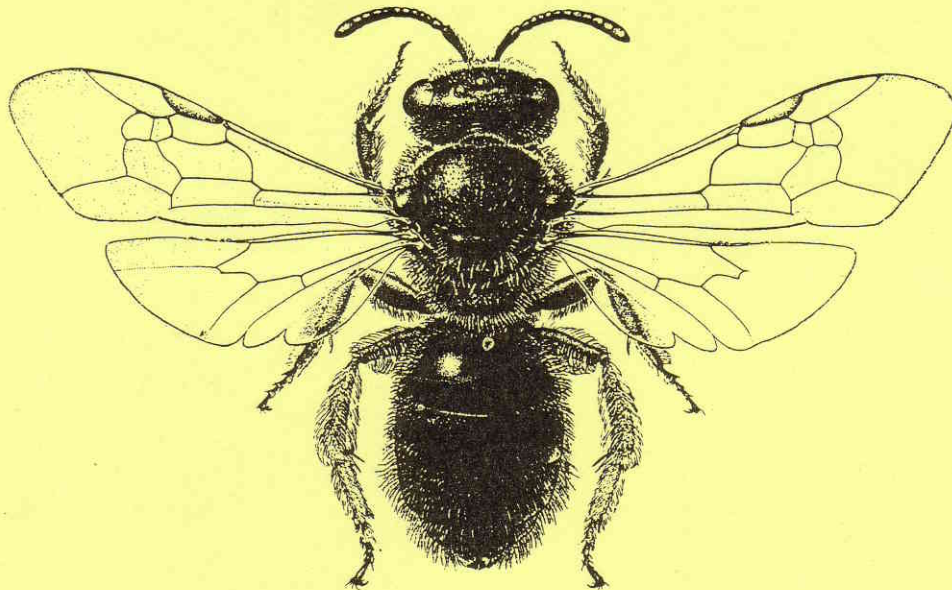
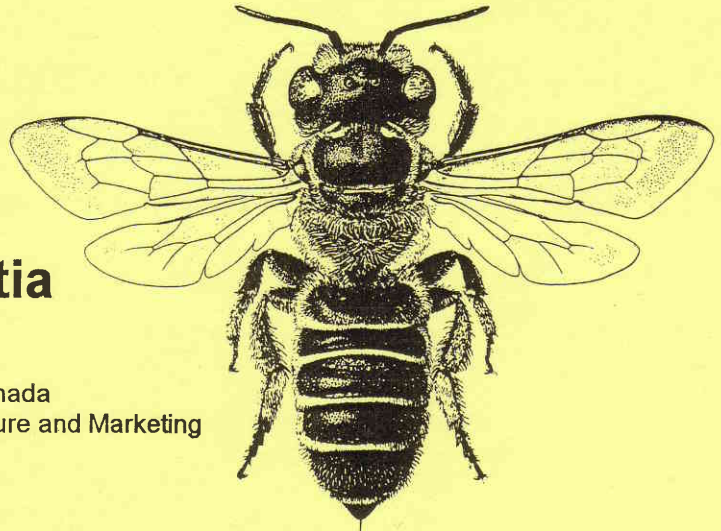


Bee Pollinators of Apple and Lowbush Blueberry in Nova Scotia

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Cover Drawings

Top: Megachilidae (Source: Bee Genera of North and South America)
Bottom: Halictidae (Source: Bee Genera of North and South America)

Introduction

Cross pollination is essential for apple and lowbush blueberry production. This process involves the removal, transport and deposition of pollen from the male reproductive structures (anthers) of a flower, to the tips of the female reproductive structure (pistil) of another flower. Bees are the primary agents of pollen movement for both of these crops.

A diverse bee fauna, representing four families, is associated with pollination of both apple and lowbush blueberry. These are the Apidae (honey bees and bumble bees), Andrenidae (andrenid or mining bees), Halictidae (halictid or sweat bees), and the Megachilidae (leafcutting and mason bees). An additional family, the Colletidae (cellophane bees), has been reported on lowbush blueberry but not apple.

Bees within these families are either **native** (occur naturally on the crop) or **managed** (introduced onto the crop to supplement native bee pollination). Bees are further differentiated by their life style (level of organization) as either **social** or **solitary**. Social bees, such as honey bees and bumble bees, are characterized by a colony made up of an egg-laying queen and two or more generations of adult females that function as workers. The majority of bees (Andrenidae, Colletidae, Halictidae and Megachilidae) are solitary. That is, each female working alone constructs a series of cells that are provisioned with food (pollen and nectar) for her developing young. A summary of the general classification of bee pollinators associated with apple and lowbush blueberry is shown below in Table 1.

Table 1. Classification of Bee Pollinators Associated with Apple and Lowbush Blueberry in Nova Scotia.

Domestication Status	Life Style	Family	Genus	Estimated Species Number	
				Apple	Blueberry
Managed	Social	Apidae	<i>Apis</i>	1	1
	Solitary	Megachilidae	<i>Megachile</i>	0	1
Native	Social	Apidae	<i>Bombus</i>	7	7
	Solitary	Andrenidae	<i>Andrena</i>	10	14
		Colletidae	<i>Colletes</i>	0	1
		Halictidae	<i>Halictus</i>	1	2
			<i>Lasioglossum</i>	1	1
			<i>Evylaeus</i>	3	5
			<i>Dialictus</i>	4	4
			<i>Augochlora</i>	0	1
			<i>Augochlorella</i>	0	1
Megachilidae	<i>Osmia</i>	1	3		

How to use this Booklet

The purpose of this booklet is to aid in the identification of bee pollinators, and to provide information on their basic biology, habitat and pollination status. Information on each group of bees is presented in five sections.

Classification The domestication status (native or managed) along with the family, genus, and where appropriate, species of the bee is listed.

Description This section describes the overall appearance of the bee by size, colour and pile (ie. the hairiness of the bee). Often a range of sizes or colours is given to encompass the variability within a family. This section should be used to narrow the field of possible choices by eliminating those groups that do not fit the general description.

Diagnostic Features These are groups of features that distinguish the bee in question from all other bees. In order to see many of these features bees must be caught and examined with a hand lens (10X-14X). Line drawings accompany each of the diagnostic features to help pinpoint the structure on the specimen.

Biology and Habitat This section describes the general life history and nesting habitat for each group of bees. The preservation of such nesting habitat within the agroecosystem will help to encourage native bee populations.

Pollination The general status of each bee group as pollinators of apple and lowbush blueberry is listed.

Colour Plates

A series of colour plates showing representative bees from each group are found at the end of the booklet.

Definitions

Corbicula The pollen basket on the hind leg of honey bees and bumble bees.

Bee Wing Bees have two pairs of membranous wings made up of cells bounded by veins. A

darkened area along the leading edge of the fore wing is called the stigma.

Facial Fovea A depressed, often pubescent, area along the inner orbit of the compound eye.

Provision Mass The pollen and nectar mixture provided by all solitary bees as food for the developing larvae.

Scopa A brush of specialized hairs with which bees transport pollen. In most families it is situated in the hind legs, sometimes on the sides of the thorax or, in the leafcutter bees, on the underside of the abdomen.

Suture An external line or groove in the body wall.

Trap Nest An artificial nest, consisting of a group of tunnels, that are used to encourage nesting by *Osmia* bees.

Tumulus A mound of excavated earth around the nest entrance of a ground nesting bee.

Acknowledgements

Line Drawings

Hymenoptera of the World: An Identification Guide to Families; H. Goulet and J.T. Huber, Agriculture Canada Publication 1843/E, 1993. (All drawing except those mentioned below).

The Bee Genera of North and South America (Hymenoptera: Apoidea); C.D. Michener, R.J. McGinley and B. Danforth, Smithsonian Institution, 1994. (Honey bee and bumble bee hind legs, *Osmia* abdomen).

Photography

Paul Illsley (National Institute of Applied Photographic Sciences).

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ALFALFA LEAFCUTTER BEE

Plate 1: A(x), E

Classification

Managed / Solitary

Family: Megachilidae

Genus / Species: *Megachile rotundata*

Description

Size: 8-9 mm

Colour: Black with pale yellow pile. Pale yellow to white bands on the abdomen.

Pile: Moderately hairy

Diagnostic Features

Black bees with conspicuous pale yellow bands on the abdomen. Abdominal scopa present on females (Figure 1). Subantennal sutures directed towards the outer edges of the antennal sockets (Figure 2). Front wing has two submarginal cells (Figure 3).

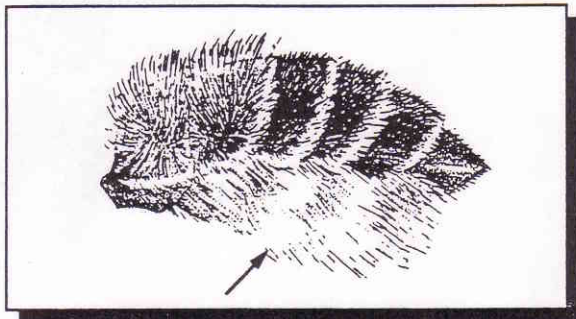


Figure 1

Nesting Sites and Biology

The alfalfa leafcutter bee is a solitary tunnel nesting bee. Large populations of these bees can be managed because they nest gregariously and readily accept man-made nesting material (drilled wooden or polystyrene blocks). To prepare the bees for pollination, overwintering prepupae are removed from storage (5°C) and incubated at 30°C for 23-25 days. Newly emerged adults are then

ready for release onto the crop. Following release each female chooses a nesting tunnel in which she

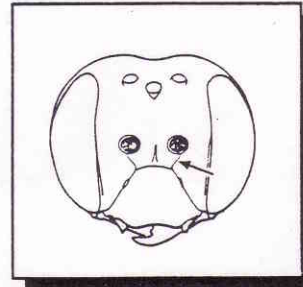


Figure 2

constructs a thimble shaped cell from about 15 oval shaped leaf pieces. Each cell is provisioned with a pollen mass moistened with nectar, onto which an egg is laid. The cell is then capped with an additional 2-3 leaf pieces. Cells are arranged

linearly until the tunnel is filled. The female leafcutter then caps the tunnel with a solid plug of leaf pieces. Under ideal field conditions, a female is able to produce 12-15 cells over her life span.

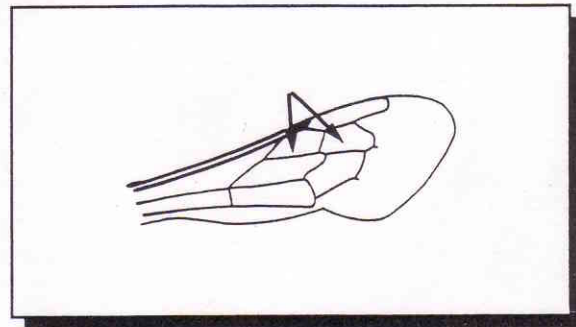


Figure 3

Parasitic Forms

Coelioxys is a parasitic member of the Megachilidae. It closely resembles *M. rotundata* but has a sharply pointed, elongate abdomen. Female *Coelioxys* use this long abdomen to deposit an egg on the pollen provision of the host leafcutter bee. The *Coelioxys* larva churns up the pollen which destroys the host egg.

Pollination

Leafcutter bees are effective pollinators of lowbush blueberry.