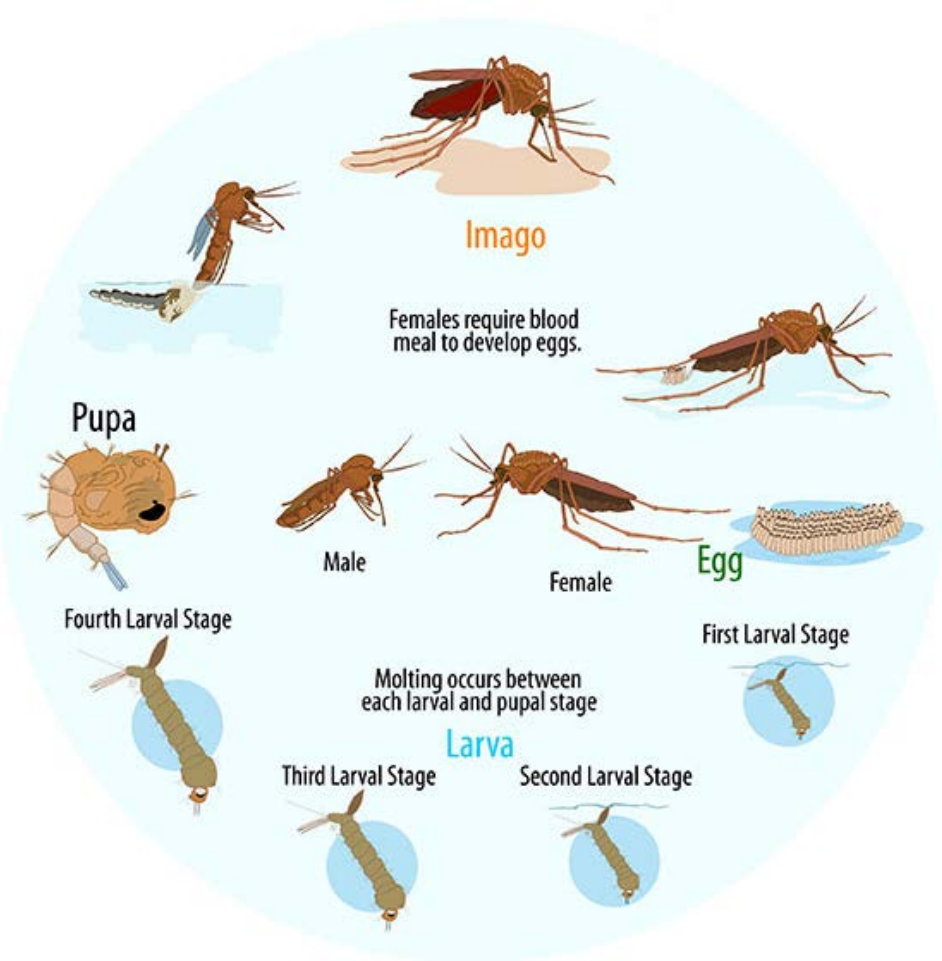
The biting flies belong to the order Diptera, the same order houseflies belong to.

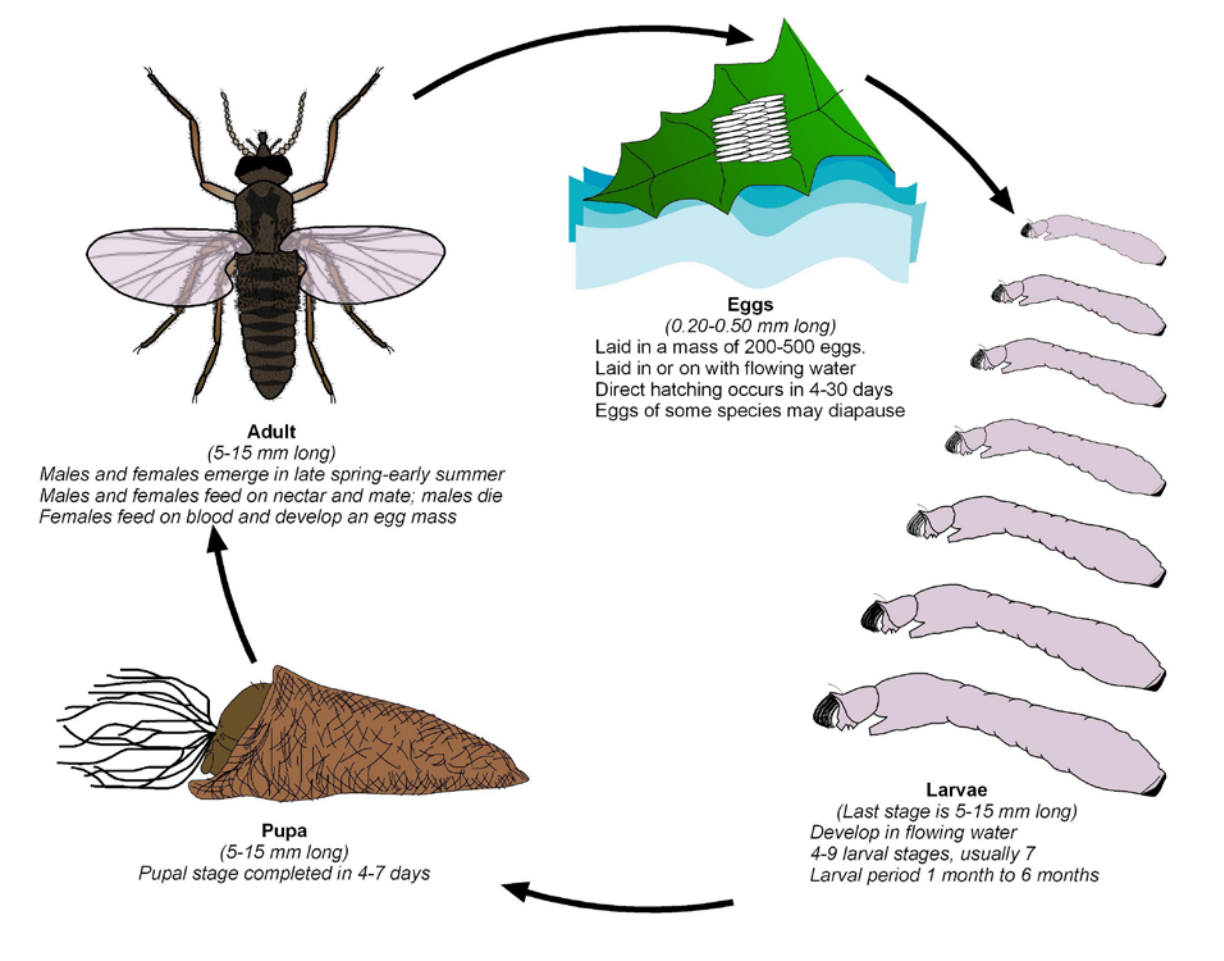
Simuliidae (black fly)

Culicidae (mosquito)

Muscidae (housefly)

All Diptera go through a life cycle that includes a eggs, several larval stages, a pupa and a reproductive adult.





General life cycle of blackflies:

- Female blackflies lay eggs in moving water.
- Blackfly larva don’t come to the surface to breath oxygen. They absorb oxygen from the water which is why they need to complete their larval stages in well oxygenated moving water.
- The eggs hatch and the blackflies go through 4-8 larval stages over the fall and winter.
- Come spring the larva begin to spin cocoons attached to stones or other objects in the water. The larvae changes into a pupa within its cocoon.
- When the temperature is warm enough the adult blackfly emerges from the pupa and its cocoon inside a bubble it has produced. It floats to the water surface and takes flight almost immediately.

General life cycle of mosquitoes:

- Female mosquitoes lay eggs in still water.
- Mosquito larva come to the water surface to breath oxygen through a siphon on their tail end so they can complete their larval stages in still water.
- Mosquitoes often overwinter as eggs deposited in depressions in the ground which will fill with water during the spring melt or during high tides.
- The eggs hatch and the mosquitoes go through 4 larval stages during the winter.
- At the end of the last stage the larva changes into a free-swimming pupa. The pupa will surface to breath oxygen through the “trumpets’ on its head.
- Within the pupa the mosquito matures into an adult mosquito which emerges and flies off.

After the adults of both black flies and mosquitoes emerge from the pupae they feed on sugar, usually in the form of nectar or sap.

The males of both black flies and mosquitoes only feed on sugar.

The females survive on sugar, but the females of both black flies and mosquitoes on PEI also need a blood meal to mature their eggs.

Biting fly controls include:

1. **Bacteria: *Bacillus thuringiensis israelensis* (Bti)**
   Bti poses little risk to human health either from direct handling or indirect exposure. Bti toxins are only active in the alkaline conditions found in insect digestive systems. Bti may harm other Diptera during the larval stages, but Bti is one of the most selective and environmentally benign controls for mosquitos and black flies there is.

2. **Insect Growth Regulators: Methoprene**
   Methoprene has little toxicity to mammals and birds as it is easily broken down in the bodies of vertebrates. It only affects insects during their larval stages. It is somewhat toxic to shrimp, crabs and fish, but only at rates well above those used for mosquito control. Methoprene is usually formulated so that is released slowly over several weeks after it is applied.

Biting fly control includes:

3. **Botanicals and Synthetic Botanicals: Pyrethrum**
   Pyrethrum is one example of a botanical. It is quickly broken down outdoors by light and air and it has a short residual life. Pyrethrum has little toxicity for mammals, but it is toxic to fish.

4. **Chlorinated Hydrocarbons: Methoxychlor**
   Methoxychlor can continue to work for days to weeks after it is applied, so it may be used as a residual spray to control adult mosquitoes in yards and recreational areas. It has low toxicity to warm-blooded animals (e.g., humans and their pets).

5. **Organophosphates and Carbamates: Chlorpyrifos, Propoxur**
   While these chemicals are used to control mosquitoes, they have the potential to be toxic to other animals such as crustaceans, fish and bees.

Most mosquito larvae and blackfly larvae are filter feeders in that they filter their food from the water using labral fans (black flies) or mouth brushes (mosquitoes).

Because the larvae of both black flies and mosquitoes are filter feeders the easiest way to treat them is to attach a bacterial or chemical control to material the larvae will filter out of the water and consume.

Bti is regularly used in this way, and it is probably the safest method of controlling black flies and mosquitoes.

However, it must be understood that any method used for black fly or mosquito control is only that, a control. Black flies and mosquitoes are such an integral part of our ecosystems, it will not be possible to completely eliminate them short of paving over every bit of PEI.