



## Lepidopterology -- The study of butterflies and moths

The following are some ideas for some **CRESTable** student led investigations..

-  Which is the most favoured nectar source? Plant three different sources of nectar close to each other and document which butterflies visit the flowers. List of plants are on the [MBNZT website](#). What would be needed to document how many flowers there were on a plant?
-  What percentage of Monarch larvae pupate facing the same direction?
-  Which is the easiest milkweed to grow? Buy (?) three packets of different milkweeds off the [MBNZT](#) (buy two/get one free) .Choose from giant swan plant, scarlet tropical milkweed, gold tropical milkweed, swamp milkweed. Plant the seeds into egg containers. Document the progress using the Milkweed Diary on the [MBNZT](#) website.
-  How much milkweed plant leaves does a Monarch caterpillar eat? Very accurate scales needed.
-  How does milkweed flowering time vary within a given area?
-  To grow brassicas without damage from White butterflies without the need for pesticides. Set up three identical gardens but plant them differently:
  - Control is brassicas.
  - Others could be:
    - two brassica plants plus a mixture of strong-smelling herb plants such as rosemary, marigolds, garlic etc
    - two brassica plants plus several strong-smelling plants of a herb such as rosemary, marigolds, garlic etc
    - brassica plants which are sprayed with a liquid made from leaves of other strong-smelling plants such as lettuce.
    - solely nasturtiums (which are a brassica).
-  Are milkweed plants that produce flowers different than plants that don't produce flowers (larger/smaller/older/in denser stands/in less dense stands, etc.)?

## ***Adult Condition and Behaviour***

### **Female Oviposition Behaviour:**

- 🦋 Do females prefer to lay eggs on certain milkweed species?
- 🦋 Is plant age, size, and condition important to female host plant choice?
- 🦋 How does the presence of monarch larvae or other insects on milkweed plants affect female host plant preferences?
- 🦋 Does plant density or diversity affect the probability of females ovipositing at a particular site?
- 🦋 How far do females fly between oviposition events?
- 🦋 Does temperature or weather affect how many eggs a female can lay?
- 🦋 Does female age at the time of oviposition affect the survival or reproductive success of her offspring?

### **Adult Movement and Behaviour:**

- 🦋 How far do adults travel each day during the summer?
- 🦋 Are male and female movement patterns the same?
- 🦋 How much time do monarchs spend foraging, and do they prefer certain types of flowers?
- 🦋 Do adults prefer some kinds of flowers to others as nectar sources?

### **Comparison of Adults at Different Seasons:**

- 🦋 Do the vanishing bearings of monarchs captured at different times of year and different locations vary?
- 🦋 Does adult size, condition, disease status, or sex ratio vary with seasons?
- 🦋 How does adult behaviour vary with seasons?

## ***Larval Survival and Behaviour***

### **Larval Survival:**

- 🦋 At what stage are larvae most susceptible to natural enemies?
- 🦋 Does larval survival vary with time of year or geographic location?

🦋 How does the survival of different larval instars vary between the lab and the field?

🦋 How common is parasitism by tachinid flies, and what stages are larvae attacked?

🦋 Does proximity to ant colonies or the presence of aphids affect larval mortality?

🦋 Does larval density or host plant species affect larval survival?

🦋 How susceptible are monarch pupae to natural enemies?

### **Larval Behaviour:**

🦋 How often and how far do larvae move at different stages?

🦋 Do larvae prefer different types of milkweed?

🦋 How much time do larvae spend eating, resting, moving, hiding, etc.

🦋 What fraction of larvae sever mid-veins on milkweed leaves, and does this affect their survival or feeding behaviour?

🦋 Do larvae eat at night?

🦋 What are the characteristics of sites larvae choose for pupation?

🦋 How does temperature affect larval feeding patterns?

🦋 How does the amount of light affect larval behaviour?

🦋 How do larvae react to loud noises?

### **Development and Physiology**

🦋 How much weight do monarchs gain from one instar to the next?

🦋 Does larval size affect the mass, wingspan, and reproductive success of adults?

🦋 How does temperature affect the development time and size of monarchs?

🦋 Do monarchs grow at different rates when feeding on different milkweed species?

🦋 Does larval host plant affect final adult size?

🦋 In what kinds of locations do larvae pupate?

## *Milkweed Biology and Pollination by Monarchs*

- 🦋 Do the kinds or numbers of herbivores on milkweed plants vary over the season?
- 🦋 Do different milkweed species vary in the kinds or numbers of herbivores present?
- 🦋 How does milkweed flowering time vary within a given area?
- 🦋 Are milkweed plants that produce flowers different than plants that don't produce flowers (larger/smaller/older/in denser stands/in less dense stands, etc.)?
- 🦋 What types of insects most commonly pollinate milkweed plants?
- 🦋 Does plant size, nectar production, and flower size or number affect milkweed pollination success, or number of visits by pollinators?
- 🦋 Are milkweed plants pollen-limited?
- 🦋 Are monarchs important pollinators for milkweeds or other species?

### **Websites:**

- 🦋 **CREST:** <http://www.royalsociety.org.nz/teaching-learning/crest/>
- 🦋 **Monarch Butterfly New Zealand Trust:** <http://www.monarch.org.nz/monarch/>
- 🦋 **Science Learning Hub:** <http://www.sciencelearn.org.nz/Science-Stories/Butterflies>

