Special Tips From Nigel Venter & Butterfly Boutique

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These butterfly-raising articles are being provided in the hope that the information will be useful and interesting to butterfly enthusiasts and commercial breeders alike. Sincerely – Linda Rogers, Nigel Venters, Grace Venters, and Paul Chesterfield (Butterfly Boutique)

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## Temperature Chart to Regulate Livestock Growth

### I. OVA (DAYS TO HATCH)

<table>
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<th>Species:</th>
<th>American Lady</th>
<th>East Black Swallowtail</th>
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**NOTE:** Day number = days for summer 2nd brood. OW = Overwinters
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**VI. DAYLIGHT HOURS**

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**NOTE 1:** The Mourning Cloak lives for up to 11 months and can endure extreme cold as an adult and can be kept for a very long time in the fridge as long as it is well fed.
Sexing Monarch Pupae

Nigel Venters

Nigel Venters has provided this excellent illustration which shows clearly how to tell the sex of Monarch butterfly pupae.

SEXING MONARCH PUPAE can easily be done with a good magnifying lens. This image has been enhanced to show the differences you need to look for. The enlargements of the anal segments to the right of the picture give a closer view of the difference.

THE MALE PUPA is at the top of the picture, it has a small dimple on the dividing edge between the anal segment and the second segment.

THE FEMALE PUPA has a distinct indented line that extends from the middle of the anal segment to the third segment. The line divides the second segment completely.
Hanging Swallowtail Pupae

Nigel Venters

Swallowtail pupae have evolved to be upright...and tail hanging species have evolved to tail hang! With Swallowtail pupae you'll notice that the legs on the pupae always point inwards towards the stick or whatever it pupated on.

This enables the emerging butterfly to grasp with it's legs immediately it breaks free and pull itself clear of the pupal case. While many Swallowtail pupae will emerge when hanging upside down with no problems, the amount of cripples will increase over natural upright conditions...so I always stick them (leg side inwards) from the base on some rough cardboard. I use a contact glue..I dot a little on the cardboard and a little on the end and first couple of pupal segments. You have to let it dry for 5 mins and then I just place them into position to sit naturally.

I remove the strings each side of the pupae with a scalpel...the pupa drops and hangs from it's cremaster. I then use a needle that has been pushed blunt end into a pencil rubber/ eraser...with this I "Worry" the silk at the cremaster until the pupa drop into a lid lined with some kitchen roll paper, which I hold right underneath it. I then use tweezers that are bent wide and at the “teeth” ends, where I have stuck some foam rubber strips to handle them...so I really don't have to touch them with my hands. I then stick them into place as the Swallowtails. This may sound time consuming but you don't lose any and they take time to deal with in any other way anyway!

Swallowtails: Raising/Breeding Tips

Nigel Venters

1. Background:

   Human nature is a strange thing.....we tend to sub-consciously judge complexity by assumption! Swallowtails look so exotic....they are so large and beautiful....they MUST be difficult to breed!

   Now this opening statement and what follows in this short paper on breeding Swallowtails is to try and dispel the myth that Swallowtails are "Difficult to breed” They are in fact EASY to breed....and once you learn a few basic facts ....and give it a go....you'll look back and wonder what all the fuss was about!

Let's start with you catching a wild caught female....the start of the production process!

2. Getting started:

   Catching a wild female is not always so very easy...unless you start to "Think like a butterfly"....OK this doesn't mean you need to put on one of Jon Timko’s butterfly costumes and "Feel" the part you are playing! (Hahaha...Jon that mail about you crossing the road dressed as a Monarch.....gave me a good laugh) you just need to consider the function of the female....in a world full of predators....and it's you that is carrying the next generation! Males of course are much more expendable by mother nature!

   So when you "Net" a beautiful Swallowtail that just happens to be flying through your garden....the odds will favour that it is a male butterfly! You may catch a number of males and before you start asking yourself....."Maybe the females are rarer than the males?” Well this is of course not true....there is no benefit to nature’s "Survival of the fittest,” in an over production of males that can't lay eggs! So here is a few lines on distinguishing the different behaviour patterns.
3. Wild Male Swallowtails:

The male Swallowtail’s main aim in life is to pass on genes to the next generation...they of course need to feed from nectar...but most of their day is spent hunting virgin females. Some of the more ubiquitous species are great wanderers....but when they find an ideal area with plenty of both nectar and larval foodplants, they often stay to patrol a the same area again and again. Feeding can be at any time of the day and is generally on a favourite patch of flowers within their chosen patrol area. They can be seen investigating any potential mate that flies past them...and they can be quite aggressive when another male of the same species flies past....they chase after them...throwing caution to the wind and you can often watch a couple of fighting males spiralling ever higher in the sky...this activity makes them vulnerable and sometimes ends with one or both falling prey to a passing bird! As you can see this lifestyle is draws your attention to them...and is why are more likely to notice and of course catch a male Swallowtail.

How do I know if it is a male? The male Swallowtail has a pair of very well developed claspers at the anal end of the abdomen. Gentle pressure with your finger nail will open the claspers and confirm the sex.

4. Wild Female Swallowtails:

Female Swallowtails tend to be more elusive than the male. They are more inclined to stick to a routine of feeding and egg laying. Females of the tree feeding species often spend much of their time high up out of your reach laying eggs, and the best time to catch them is in the morning as soon as the sun is warm. This is when the females visit flowers for nectar that keeps them going for their egg laying routine for the rest of the day. They tend to tend their time along forest edges....or the more ubiquitous species....closer to some tree or vegetation cover in open countryside. Their flight is much more searching than the male....checking plants for suitable species for laying eggs, often wandering up and down hedgerows or searching suitable Umbelliferae plants in quite a organised flight routine.

The next thing you need to know about a female Swallowtail you have just caught is.....it is 99.9% certain that it has already mated...and is carrying viable eggs. Believe me...you may think you are sharp and quick and the female you have just caught is "Very fresh,".....but with all that "Male," activity described above....you will not beat the male to the female!!!!!! In some species of butterfly the males congregate around a female pupa as it begins to emerge...just waiting their chance!

How do I know if it is a female? The female Swallowtail is nearly always much fatter than the male....but the real distinguishing feature is the lack of claspers and the distinctive opening one segment back from the anal point of the abdomen. In many species there is some distinguishing coloration and/or wing marking to help you confirm your decision.

5. Hill Topping:

One little known fact about Swallowtails is an activity known as “Hill topping” Many different species of butterfly "Hill top"....but it is especially prevalent amongst the Swallowtails and many Nymphalids like Painted ladies and Red admirals. The males of these species fly to and congregate on the highest available ground in the area....they then fly a patrol around the hill top or on the sunniest side of the hill. This works well at the start and end of the flight season...when the species are more thinly dispersed. Unmated females will make their way to the high ground and fly up towards the top....where they are intercepted by the waiting males. I have found this a very effective way of catching wild females.....especially in the warmer more tropical regions. There is of course a slightly increased chance of the female being unmated at these sights....but believe me...the chances are still very high that she will be paired.

6. Aristolochia feeders:

In the USA there are a few Swallowtail species (Pipevines for example) that feed on Aristolochia. These plants are very poisonous and pass on a protection to both the larvae and the adult butterfly. Aristolochia feeders tend to behave differently from most other Swallowtails...it is in their interest to be seen and identified by potential predators.....so they will be left alone. Both males and females tend to fly a much slower flapping flight and take far less precaution against predators. Larvae of these species tend to be far more conspicuous than non-poisonous species, and feed openly in full view of predators. This does not fool parasitic wasps of course....which are unconcerned about the poison!
7. Now you’ve got your female...get her to lay!

The Swallowtails do need a little space to lay well. Watch the females laying eggs and you’ll notice they like to grasp the plant with their feet....but at the same time keeping their wings fluttering. They lay only one or two eggs on each leaf before flying on...and unless you provide enough space for them to fly around the larval food plant and “Flutter,” you will not get the full potential of eggs. Some species require less space than others....but as a general rule....you won’t go far wrong with a 3ftX 3ft cube cage.

A few "Must do’s,” for you to consider.

7.1. Always make sure the foodplant reaches the top of the cage.

7.2. Place a good number of cotton wool balls soaked in 10% sucrose solution with few drops of Soy sauce (for minerals) on the top of the cage.

7.3. Do try and place some nectar flowers in the cage as well as sugar pads.

7.4. For best results place the cage in Dappled sunshine and keep the top and side well sprayed with water in hot weather.

7.5. In the evening....take the females inside the house and force feed them under lights by unrolling their tongues into the nectar solution. (For those of you that have Linda’s and my manual...use the device shown in Section 4.0. Commercial Volume Start up and operation Subsection 4.3. Time Saving and Efficiency Devices Page 3 of 6.) You can double your total number of eggs by doing this!!!!!!

7.6. Most Swallowtail females are quite good at laying on the food plant....however some eggs will be laid on the netting. In hot weather remove these eggs each evening with a good quality Sable paintbrush (Size 5) Spray the netting with water.....wet the brush and then "Worry" the base of the egg with the brush....it will come off quite easily.

7.7. Do try and use growing larval food plant for the females to lay on.....if this is not possible, then change the foodplant plant every day...the female will soon notice that the plant has started to wilt and will stop laying so freely.

7.8. If using growing food plant leave the eggs on the plant to allow them to hatch naturally.

7.9. For all ova that you take off the netting....or collect from cut food plant....place in a sealed plastic container....but you MUST add some kitchen tissue to absorb moisture and stop mould killing the eggs.

7.10. Most eggs will hatch in 5 to 7 days. Be ready to feed the young larvae.

8. Collecting eggs from the wild.

This can be effective where you have an isolated plant in a favoured position....Swallowtail adults will smother this with eggs....regardless of how many eggs have been already laid by other Swallowtail. But in general it is time consuming and rather hit and miss....far better to catch the gravid female and get her to lay.

9. How to feed the young larvae?

U.S.A. Swallowtails break into four groups....any identification guide will tell you which species you have got. They are:
9.1. **Aristolochia** feeders...be careful, most of these will not take Aristolochia elegans (The Calico flower) Aristolochia fimbriata is often quoted as a good foodplant....but it is very small and produces very little leaf. All other North American Aristolochias will be just fine! Choose a vigourous large leaved variety.

9.2. **Queen Anne’s lace** (Umbelliferae feeders) The main problem here is that these plants wilt so easily! Dill, Wild Carrot, Caraway, Aniseed and Fennel. (fennel is one of the best food plants if you can provide growing plants....it is perennial and come up every year unlike a most of the of others). But the VERY BEST IS.... Rue...Ruta graveolens is available from most nurseries. This plant is compact...has plenty of leaf for area expended, will not wilt when cut and placed in water, roots easily from cuttings....is evergreen....what more can you ask for? Another plant you may like to try is Mexican Mock Orange (Choisiya ternarta) this evergreen popular garden plant looks nothing like Queen Anne’s lace! But you will be amazed to learn that many of this group only not feed on this plant.....but grow very large on it!

9.3. **The deciduous tree** feeders. The Tigers are very easy to breed....P. glaucus being so accommodating that I managed to feed it on just about every deciduous tree growing in my garden! This ranged from Cottonwoods, Willows, Plums, Cherry...to wild blackthorn (Prunus sp)

9.4. **The spicebush** feeders are a little more demanding when it comes to feeding....the young larvae like to roll up the growing foodplant to hide in it as well as feed from it, I would not recommend using cut food plant for the best results.

10. **Feeding the larvae.**

Young Swallowtail larvae do well on cut food plant. Be careful about using cut food plant standing in a vase of water....the food plant tends to suck up too much water and becomes laden with moisture this results in loose frass and sickness/death of the larvae as they develop. Where sleeving over a growing food plant is not an option, I use a sealed plastic container for the first two instars, with cut food plant. Be warned after the third instar you will loose a lot of larvae to disease if you continue to use a closed plastic container. In the third instar you need to use a netted container that allows some sort of air circulation. OK....now with air circulation...you are thinking....wilting food plant....well I use florist's foam...I soak some of this foam and then cover it with cling fiilm....I then use a knife to make holes so I can push the stems through into the foam. This keeps the food plant fresh without allowing it to become waterlogged and kill your larvae. If you have the luxury of growing food plant in your garden then sleeving over a branch or pot of food plant is the answer...almost no maintenance...watch for when they start to run out of food....but for a non-gregarious larvae they seems to do quite well in crowded conditions when sleeved on growing food.

Young larvae of most Swallowtail species are designed to look like bird droppings.....and unless you can identify the species from the plant you found them feeding on...it may be difficult to distinguish the different species until they reach their third or even forth instar. The “Bird dropping,” can only be believable by predators up to a certain size so the Swallowtail larvae then tend to take on a greenish color to blend in with their food plant (Note this does not apply to Aristolochia feeders)

In the final instar....do not be alarmed when the larvae turn brown...drab or even yellow (Spice bush Swallowtail turn yellow before they pulate) this is to offer them some protection while they search for somewhere to safely pulate. Be warned if you are breeding a large number of Swallowtail larvae together they do tend to wander around a cage for a long time before they settle....this can often disturb larvae that have already started to pulate...and this can result in a higher than normal number of cripples. I often take “Wanderers” out of the cage and place them in smaller numbers in a number of separate cages to avoid this problem.

11. **How many generations a year?**

This rather depends on where you live....if you are relying on breeding outdoors the further North you live then the less generations you can expect per year. Swallowtail larvae when crowded tend to pulate en-mass, and your may be surprised to learn that it is not just temperatures that effect the emergence....but light levels! For example an experiment with P. glaucus (Eastern Tiger Swallowtail) where I put all the August formed pupae in my fridge at 5C resulted in all of them coloring up and emerging in late September regardless of the low temperature they experienced. All I managed to do was slow the development process up! There is no doubt that genetics plays a part here and that the same species from a Northern latitude is pre-programmed to only have one or at the most two generations a year. Southern examples of the same species may have four broods! However once you have hit the diapause you can use this to your advantage!
12. Why are they so difficult to judge when they will emerge from the pupa?

Whenever you read about Swallowtails...this message comes over loud and clear! The confusion is created by people breeding at different latitudes discussing the same species that is programmed to emerge at different number of times a year depending on latitude! A simple rule of thumb can be used. Wherever you live, in a normal year there will be a set number of generations of any particular species. This will only vary when you have an exceptionally warm or cold summer...you may gain or lose one generation. Once you have determined this for your own area...you can then start to take control! So increased warmth of the final years generation will make it complete it's development earlier than normal...thus give you a further generation...but if you put the final year's generation of pupa into the fridge for six weeks...then bring it out into warmth...you'll have tricked it into thinking winter is over...and it is time to develop and hatch again...you need to wait a few weeks but within a month the pupa will hatch. Much has been written about the color of pupa to determine if they will hatch the same year....well to some extent...green colored pupa will hatch the same year and brown will overwinter...but don't put money on it! Be warned...you can not guarantee this at all...and I have had many green pupa that overwintered and vice versa!


There is really only one way to overwinter Swallowtail pupae...and that is in the fridge. This allows you to keep a constant diapause temperature...and as such allow you to determine when spring has arrived. Many breeders will say overwinter in an outhouse or unheated garage...the problem with this is...where do you live? If you live in an inland area...with well determined seasons...spring arriving...with no slips back to winter when the wind changes to the North...then fine! But as it is well known that a poor spring can so badly affect wild butterfly populations why take a chance? The fridge allows YOU to decide when spring has arrived and there is plenty of food plant to feed the larvae on. Place the pupae on DRY cotton wool in a small airtight plastic container...you can pack them in tight...do not worry about breathing or air holes...they don't need it! Once sealed put in the fridge until spring...Do not open until the spring......DO NOT add water or try to keep them damp...as many books suggest...this will make them go mouldy and kill them.

14. OK they've hatched what do I do now?

The beauty of breeding Swallowtails is how easy it is to hand pair the adults! A few basic rules need to be followed:

14.1. The males need to be a few days old before trying....three days or more is good.

14.2. The females need to be as fresh as possible....but make sure the wings have hardened before trying to hand pair....Do try to pair before the end of day two after hatching.

14.3. Normally nature ensures that the males hatch before the females. In captivity things can change! If the female/females hatch before the males...put them in the fridge at 5C in a sealed plastic box with some kitchen towel as grip....they can last a week or more awaiting the males to hatch and still be viable.

14.4. If no male has hatched within a week...feed the females (As described in 7.5 of this paper) BUT REMEMBER.....leave them out of the fridge for a few hours to allow them to digest their food...then place them back in the fridge to await a male emerging. You can keep this up for at least three weeks and keep them viable if you feed them well.

14.5. Hand pairing is a visual thing....very difficult to describe....I made a video of this and I'm sure the IBBA will make this available for those who would like to own it. Or again there is a detailed account and photographs available in Linda's and my manual.
Eggs & Egg Washing Technique

Melanie McCarthy & Terry Terbush

(Jan 2013 - Recipe amended for use with more concentrated bleach)

(Refer to photos at bottom of page.)

Recipe:

Take 200 Monarch eggs off your plants; put in fridge in airtight container until you are ready but for no longer than 7 days; take eggs out and gently drop into a strong screened coffee filter; then take all and immerse in egg wash solution.

Here is how to make the egg wash solution in undiluted form. It is bleach and water and different butterfly farmers have experimented and use different percentages of bleach. This is what has worked for us: if using bleach with active ingredient of 8.5% - 9%: 2 cups bleach to 9 cups water. Add two or three drops of Ivory Liquid Dishwashing Detergent-- which makes the spores very slippery and they come right off. After you make up this batch of concentrated bleaching solution, when washing the eggs, dilute by using 19 parts water to one part solution (above) to make solution to wash that day's eggs. One breeder uses 1 tablespoon of the concentrated solution to 19 tablespoons of water. This gives you plenty of egg wash for one treatment.

Method:

Put your final solution into a glass bowl that will accommodate the copper colored filter with the eggs already in the filter. Turn your timer on for 7 minutes. Immerse the copper colored filter into the final wash solution. Agitate the eggs for 7 minutes, constantly. Use a turkey baster to spurt water onto the eggs which will cause a lot of agitation of the solution all over the egg, on top of the egg, the sides and the bottom. After 7 minutes remove the filter from the solution and rinse the eggs for 3 minutes each three different times in clean bowls of water. Use the same filter, the same turkey baster. For the Finale, perform the Egg Swirl.

Egg Swirl:

As you remove the coffee filter from the water (with the washed and now rinsed eggs), swirl the mixture around so that about 1/2 the eggs swirl to 1/2 of the filter and are scattered up and down the side, then turn the filter over and dunk the other half back in so that the remaining eggs swirl over the other half of the filter. Voila!

Now lay the filter down on a clean/sterile surface covered with a napkin or paper towel which will instantly begin to absorb the excess liquid, until the eggs dry. It will take about 4-6 hours for the eggs to dry enough. Then pick up the filter and tap the sides with a utensil. All the eggs drop to the bottom. No sticking or mushing of eggs! And best of all, you only use 1 tablespoon of your concentrated solution per day. Remember, the egg wash solution is concentrated so before you actually use it on your eggs, further dilute it by 19:1. 19 parts water; 1 part solution.

After the eggs are dry, pour them into a sterile (tiny) container or souffle dish, breathe on them to add some moisture back since the bleach can be drying and then cover with an airtight lid. Let them hatch out completely. Keep only the same age eggs together, do not mix eggs layed from different days as you want all the eggs in this vial to hatch out at the same time. When they hatch out, you can either add a leaf or two of milkweed so they can crawl onto this or better yet take a 6 oz sterile cup and stand up some milkweed in the cup. Turn over your container with the newly emerged larvae and tap on it with a heavy butter knife. All the new larvae will fall onto the milkweed in the next larger sized cup.
Glass bowl

Copper-colored coffee filter

Eggs sitting in solution ready to be agitated

Eggs being agitated with turkey baster

Bowl with solution and turkey baster alongside

Draining...

Eggs left in filter

3 bowls of clean water to rinse the eggs 3 times at 3 minutes each using turkey baster
After the eggs are swirled around the coffee filter, they are laid onto a paper towel or napkin to dry for about 4 - 6 hours.

Tiny cup to store clean eggs
Some Great Nectar Plants

Lantana

Verbena bonariensis

Ixora

Buddleia fallowiana
(similar to B. davidii, but more compact)

Pentas
Nectar Plants For Hanging Baskets

African Marigolds

Verbena

Artificial Nectar and Ways to Use It

The Recipe:

Dissolve 2 lbs. of sugar with boiling water to make up a fairly thick syrup. Only add enough boiling water to dissolve the sugar, and this is a very strong solution. To this add a few drops of mineral-rich Soy Sauce. This provides some added salts, vitamins and minerals to the nectar. Make sure you get regular Soy Sauce and not low sodium or diet version, as our aim is to get as much energy as possible into the butterflies. At this stage, you have a weak, tea-coloured syrup, which is thick but not too difficult to pour into a pop bottle after it has cooled.

Because sugar is a preservative (that’s why jam doesn’t go moldy) this nectar solution is far too strong to ferment. You don’t need to store the bottle in a fridge, and it stays good forever!

To make up nectar for feeding, take the strong syrup, pour and dilute it with water - in this case to about 20% (which is quite strong). However, only make up as much of the diluted solution as you need, as now it will of course ferment and go sour after a few days as all other nectars do.
Below are some examples of using artificial nectar in feeders, allowing the butterflies to feed themselves.

On the left is a butterfly feeder that does not really allow mass feeding. In top center photo we use plastic kitchen scrubbers. Photos on right show two shots of rare White Monarchs feeding on artificial nectar, in bowls containing nectar and scrubbers. Very efficient!
Hand Feeding Butterflies

This is quite a simple process, and you can easily make the rigs and feeding board yourself with a few easy-to-find items. After you get used to doing this, you can feed 100 Monarchs in less than half an hour. The tray board is an old plastic table top. The feeding trough is a PVC water pipe sectioned in half with the ends sealed. The trough is fixed to the tray using a glue gun.

It is quite interesting as the butterflies soon get used to this, and after a few times, many actually extend their tongues in anticipation of a feed as soon as they are on the rig. I usually feed them 20 at a time on these rigs.

Butterflies on feeding rig. You can easily adjust the rig up or down and backwards and forwards.
Video Instruction: Hand-Pairing Butterflies:

http://www.butterflyboutique.net/cd2/handpairing_files_58784.html

“Dinner And A Date”

Photo by Judi Sunshine, Butterfly Farming Supplies