

獨角仙亦有人稱「台灣大兜蟲」。80mm。2003
Handsome *Allomyrina dichotoma*.



獨角仙與基本兜蟲

Allomyrina dichotoma and the Basic Rhinoceros Beetle

↓ 獨角仙是所有兜蟲中唯一犄角分叉為四的。1995
Allomyrina dichotoma is the only rhinoceros beetle that has a horn that splits into four points.





我覺得最適合剛入門的朋友飼育的種類要有三個條件：

1.簡單取得 2.長相非凡 3.飼育容易

相信很多資深的飼育者都能同意，最符合以上條件的蟲種為獨角仙。雖然在野外其產量已大不如前，但跟很多兜蟲和鍬形蟲比起來，獨角仙還算是容易尋得的種類。除了數量多以外，獨角仙也擁有特殊的長相。不但其體型為台灣第二大的金龜（第一大為台灣長臂金龜），獨角仙還擁有所有兜蟲中唯一能夠分叉為四的犄角。至於飼育，獨角仙的幼蟲是我養過的兜蟲和鍬形蟲中，對腐植物最不挑剔，幼蟲期偏短的種類。

除了符合以上的三個條件以外，獨角仙也是大家都有聽過以及最有機會見到的甲蟲之一。有相當多的非專門店，例如水族館、校園門口小販，以及一些觀光地點的小販都會季節性地販賣從野外採集的獨角仙成蟲。根據經驗，有好一部分曾經飼養過獨角仙的朋友都是在偶然的情況下，由於遇到賣獨角仙的小販，但又無法擺脫牠們的吸引力而開始飼養的。雖然有很多臨時起意在小販或是水族館買獨角仙成蟲的朋友，起先都只是想買來玩一玩而已，但飼養了之後卻不知不覺地對其一生產生興趣，甚至想進一步地繁殖牠們。由於獨角仙是一般大眾最有機會遇到、又最有可能想繁殖的種類，其飼育方法的確很適合第一個介紹給大家。而這裡順道一提，獨角仙有個特殊的體味，這是與生具有的，千萬不要因此把獨角仙抓去刷洗。

I start with this species for several reasons. One, it is no doubt one of the easiest rhinoceros beetles to culture, as its larvae are not finicky about the substrate used and become adults in less than one year. Two, *Alomyrina dichotoma* is the most commonly kept rhinoceros beetle in Asia and therefore one of the most representational members of the Subfamily Dynastinae. Three, it has one of the most unique horn formations of all the rhinoceros beetles, with the cephalic horn splitting into four sharp points at the end. Four, this rhinoceros beetle is handsomely built, with some individuals measuring more than 9 cm.

Here in Taiwan, people are more likely to run into *A. dichotoma* than any other rhinoceros beetles. For one, it is indigenous to Taiwan. Two, it is periodically offered for sale by non-specialty stores such as fish shops and street vendors at popular tourist destinations. In fact, a good portion of hobbyists got their first *A. dichotoma* because they ran into a vendor and couldn't resist the beetle's charm. In the beginning, they only bought a beetle or two without any long-term plans. But after bringing them home, they found out that these are absolutely fascinating creatures. Then they wanted to breed them. And that was the beginning of no ending. *A. dichotoma* naturally possesses a funny odor. It cannot be washed away. When rhinoceros beetles are frightened or agitated, they rub their abdomen against their elytra to produce hissing sounds.

When picking out a rhinoceros or stag beetle, look for one with strength. A healthy



↗裝死中的高砂鋸锹形蟲雌蟲，六肢對稱緊縮。26 mm。
2007
Female stag beetle playing dead. *Prosopocoilus motschulskii*



↗正在吸食蘋果汁液的美東白兜蟲雌蟲。1998
Dynastes tityus female drinking apple juice.

另外，所有兜蟲受到驚嚇或是激怒時，都會摩擦腹部和翅鞘，發出有趣的嘶嘶聲。

選購兜蟲或是锹形蟲的成蟲時該注意些什麼呢？活力是最重要的。但是所謂的活力並不是指在容器裡不停地爬動，而是指六肢的攀抓力道強勁。除非遇到正在裝死的個體，否則健康的成蟲放在攀抓物或是手上時，會緊緊地抱住不放。而裝死的特徵為六肢對稱地緊緊縮在腹部。另外一個小訣竅就是觸碰成蟲的觸角。如果被觸碰時，成蟲不悅地快速把頭撇開，或是做出要攻擊的動作，這些也是活力的指標。選購時也儘量挑選爪子銳利，身體沒有刮痕的個體，這些都是新成蟲的指標。不過選購時別忘了先問老闆，成蟲是否已經開始活動了。還在蟄伏期的成蟲是沒有力氣的，也不會吃東西或是交配。

其實飼養兜蟲和锹形蟲的成蟲幾乎是沒有挑戰性的。兜蟲和锹形蟲的成蟲主要以植物的汁液維生。在野外，大部分的種類以樹木的汁液、花蜜、花粉，

beetle should cling tightly onto a piece of wood or your hand. However, some individuals play dead. When they do so, they hold all six legs tightly and symmetrically against their body. Avoid weak individuals. Another trick is to touch an antenna of the beetle. If the beetle moves its head quickly or prepares to attack, it's most likely a healthy beetle. Also try to pick a beetle with sharp claws and scratch-free body. These are signs of a newly-emerged beetle. However, ask the store owner if a beetle is still in the resting period. Beetles in this stage cannot climb, nor do they eat or mate.

Keeping rhinoceros and stag beetle adults alive and healthy is easy. Although in the wild they feed on tree sap, nectar, pollen, or the liquid of fallen, rotten fruits, in captivity, they can easily be kept on slices of grocery fruits. Apple, watermelon, banana, pineapple, cantaloupe, grape, pear, and peach are all good choices. Sour fruits such as lemon and grapefruit should be avoided. The best way to present the fruits is to slice and place them on a small plastic dish. In addition to fruits, hobbyists can also purchase



或是熟透了、掉在地上的水果汁液維生。在人為環境下，所有的成蟲只要以一般市售的水果飼養便可以活得很好。但我覺得並不是每一種水果都適合飼養兜蟲或鍬形蟲。最適合的水果應該沒有酸味或只帶少許酸味。木瓜、蘋果、香蕉、軟桃、西瓜、水梨，以及鳳梨都是不錯的選擇。檸檬和葡萄柚等水果則酸味過重。在多種的水果中，蘋果和香蕉是我最喜歡使用的。只要將水果切片放在小塑膠碟子上供成蟲食用即可。除了水果以外，蟲友也可以到昆蟲專賣店購買甲蟲專用的果凍。它們最大的優點是可以長期地保存，完全沒有水果會腐爛的問題，要用的時候再打開即可，非常地方便。蟲友也可以購買果凍檯。這是一種中間挖空的木頭切片，專門用來擺放果凍的，可以說是甲蟲的餐桌。水果每2-3天便要換一次，否則會臭酸。果凍可以每3-5天換一次。但是如果在這之前便吃完則要補上新的。

如果所飼養的兜蟲成蟲只是純粹養好玩的，並不打算讓其繁殖，那麼飼養裝備可以很簡便。第一個必需品為飼養牠們的容器，材質玻璃或塑膠都是很好的選擇。最簡單的做法就是去寵物店購買觀察箱。也有蟲友喜歡使用置物箱(整理箱)，但是一定要在蓋子鑽幾個呼吸孔。如果透氣功能不足，飼料在分解發酵的過程中所排放出來的廢氣會將兜蟲或鍬形蟲給毒死。尺寸應至少有1隻成蟲全長的3倍長、2倍寬。我並不建議將一隻以上的成蟲飼養在同一個容器內。原因有二：第一，有許多雄蟲不管

specially formulated beetle jelly. Its greatest advantage is long term storage. It will not spoil as fruits do. Simply open one when needed. Hobbyists can also purchase jelly holders, which are cross sections of a tree limb with a hole drilled in the center to hold beetle jelly. They can be viewed as dining tables for rhinoceros and stag beetles. Fruits should be replaced every 2-3 days. Beetle jelly should be replaced every 3-5 days. However, if a beetle finishes it before then, a new one should be supplied.

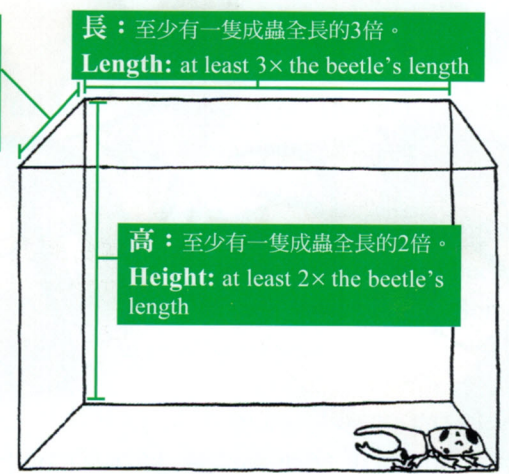
If the intention is only to keep adult rhinoceros beetles without breeding them, the setup can be extremely simple. The first requirement is a plastic or glass container for each beetle. It is important that the lid is drilled with ventilation holes. Poor ventilation will cause the beetle to die from the harmful gases emitted by the fruits or beetle jelly as they decompose. The bottom of each container should have a length that is at least three times and a width that is at least two times the length of the beetle it is going to house. I do not encourage keeping more than one adult beetle in one container. There are two reasons. One, many male rhinoceros beetles are aggressive towards one another no matter how much space is given. Two, there are also many male rhinoceros beetles that relentlessly pursue females, regardless of a female's readiness to mate; some males will even attack females that refuse to mate. Of course, there are also males that do both. As a result, unless you intend to breed them, adults of the opposite sex should not be kept together. But if you do decide to keep some of the more docile males together or together with some other females in one container,

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↗使用置物箱飼養或飼育時一定要鑽數個洞。
The top must have ventilation holes.



↗一個飼養容器的尺寸應至少有1隻成蟲全長的3倍長、成蟲全長的2倍寬，及成蟲全長的2倍高。
A keeping container should have a length that is at least three times, a width that is at least two times, and a height that is at least two times the length of the beetle it is going to keep.

空間不足夠都很會打鬥。第二，也有許多雄蟲不管雌蟲願不願意交尾都窮追不捨；有些甚至還會攻擊拒絕交配的雌蟲。因此，除非是有意繁殖，否則就是連異性的成蟲都最好不要養在一起。但如果要將一些比較沒有殺傷力的雄蟲一起混養或是將牠們與一些雌蟲混養，適合的容器尺寸如下：每多1隻成蟲必需再加上基礎尺寸的一半。例如，如果要同時在一容器內飼養4隻成蟲，而最大的一隻為8 cm，那麼所需的容器尺寸至少要有 (24 + 12 + 12 + 12 cm) 長 × (16 + 8 + 8 + 8 cm) 寬。高度應該至少有最大個體全長的2倍高。足夠的容器高度是很重要的。如果高度不足，兜蟲或鍬形蟲貼著飼養容器站起來時便會頂到屋頂。長期下來會導致身體的磨損或是犄角的斷裂。各種兜蟲的飛行能力都不錯，飼養時一定要在容器上加蓋，並且確認蓋子有牢牢地扣住飼養容器，否則兜蟲輕易地就可以把蓋子頂開爬走。

the suitable dimensions for the bottom of the container are as follows: each extra adult will need additional dimensions that are half the original. For example, if you are keeping four adults, and the largest one measures 8 cm, then the bottom of the container would be (24 + 12 + 12 + 12 cm) long × (16 + 8 + 8 + 8 cm) wide. The height of the container should be at least twice the length of the longest adult. Sufficient container height is important. If the container is not tall enough, the beetle will touch the lid when it stands up against the wall. This will cause the beetle's horns or mandibles to become scratched or even broken. Because rhinoceros and stag beetles can fly, a secure top for each container is a must.

Humidity is vital for all rhinoceros and stag beetles. Without humidity a beetle will dehydrate within hours and lose the ability to walk. (If mildly dehydrated, the beetle can be saved by putting it in a small container filled with moist paper towels.) The easiest



↑正在專心吸食蘋果汁液的美西白兜蟲。墊底物為微濕的衛生紙。在沒有人為監控的情況之下，不建議讓兜蟲或是鍬形蟲共處於一個容器內。1997

Dynastes granti feeding on apple. The substrate is moist paper towels. Without supervision, it is not recommended that rhinoceros or stag beetles be kept together.

飼養任何兜蟲或是鍬形蟲的成蟲時，再也沒有比水分更重要的了。一旦濕度不足，成蟲很快便會脫水。脫水的成蟲先是失去爬行能力，然後幾天後死亡。(如果發現因脫水而無法爬行的成蟲，趕緊把牠放入裝有大量微濕衛生紙的容器內，這樣還有機會救活。我曾經有過這樣的經驗。當時有一隻日本大鍬爬走了。由於美國非常地乾燥，我隔天找到牠時，牠已經無法行動，並且動作像機器人一樣，非常地不協調。我趕緊把牠放入潮濕的環境中。我本來認為牠死定了，但是牠卻慢慢地復原，大約5天後便痊癒了)。保持濕氣最簡單的方法是在飼養容器內鋪一些微濕的衛生紙。接著只要偶爾地噴霧或灑水便可以輕鬆地保持濕度。餵食時只要把裝有食物的小碟子放在衛生紙上即可。飼養多隻雄蟲時記得多放一些小碟子以免牠們打架。衛生紙被撕爛時或是沾有多量的排泄物時記得換上新的。兜蟲和鍬形蟲的糞便基本上為液態狀的，但是兜蟲的糞便有

way to keep a beetle's enclosure moist is to place several layers of moist paper towels on the bottom and mist every few days. To feed, simply place a small plastic dish with fruits directly onto the paper towels. If you keep multiple beetles in one enclosure, make sure you put in extra dishes so males do not fight over food. Replace the paper towels when they are stained with much excrement. Rhinoceros and stag beetle excrement is usually watery, though that of rhinoceros beetles can sometimes be thicker, especially after eating banana. Their excrement is usually yellow, though excrement from new adults may be white for the first few times. In addition, if the beetles are fed beetle jelly, their excrement takes on the color of the jelly.

If possible, give the beetle an environment that most resembles nature. In the wild, rhinoceros and stag beetles hide in decayed vegetation during the day. Layer the bottom of the tank with five centimeters of moist wood flakes of any degree of decay. Make sure the top is lined with braches so the bee-



時會比較濃稠，尤其是吃完香蕉後。兜蟲和鍬形蟲的糞便通常是黃色的，但是成蟲羽化後的前幾次排便通常是白色的。除此之外，如果有餵食果凍的話，糞便的顏色通常會和果凍的一樣。

但是如果可以的話，最好是幫兜蟲或是鍬形蟲佈置一個最接近大自然的環境。兜蟲和鍬形蟲白天都有躲到腐植物中的習慣，所以可以在容器底部鋪上一層5 cm厚的微濕、任何腐朽程度木屑。腐植物的表面別忘了多放一些樹枝，這樣兜蟲或是鍬形蟲翻倒時才能夠翻回來。一切都佈置完畢後，務必將飼養容器擺在陰暗通風的場所。兜蟲和鍬形蟲最怕陽光直射和悶熱。一旦過熱很容易便會死亡。兜蟲的成蟲只要給予微濕的環境、充足的食物、防止翻倒的攀抓物都可以活2個月以上(除非取得的個體本身就已經接近生命末期)，有些種類甚至可以活超過1年。以上是不打算讓成蟲繁殖的飼養方法

tle does not tumble over. The tank must be placed in a cool and ventilated area. Rhinoceros and stag beetles cannot tolerate sunlight and heat. They will die quickly if exposed to heat. If cared for properly, rhinoceros beetle adults can live at least two months. Some species can live over a year.

If the goal is to breed rhinoceros beetles, decayed vegetation is a must. Other than *Strategus antaeus*, which will be discussed later in the book, all the rhinoceros beetles discussed in this book will lay eggs, or oviposit, in flake soil. After hatching, *A. dichotoma* larvae can be fed hard decayed wood lumps, middle decayed wood flakes, soft decayed wood flakes, natural decayed wood flakes, flake soil, or high-decay flake soil.

The bottom of each breeding container should have a length that is at least six





如果要繁殖兜蟲，就一定要有腐植物。各位朋友是否還記得之前所介紹的各種腐植物呢？除了以後會介紹的安達佑實三角龍兜蟲以外，此書所介紹的兜蟲都肯於腐植土中產卵。獨角仙的幼蟲孵化後可用硬朽木屑、中朽木屑、軟朽木屑、自然朽木屑、腐植土、或是高腐腐植土飼養。

跟飼養時一樣，飼育時的第一個必需品也是容器。材質一樣以塑膠或是玻璃為佳。尺寸至少要有1隻雌蟲的6倍長、4倍寬。而每多1隻雌蟲再加上基礎尺寸的一半。例如，如果打算讓5隻雌蟲在一個容器內產卵，而最大隻的全長為5 cm，那麼所需的容器尺寸至少要有(30 + 15 + 15 + 15 + 15 cm)長 × (20 + 10 + 10 + 10 + 10 cm)寬。產卵容器的尺寸是很重要的。雌蟲產卵時會在腐植物中不斷地挖掘。若空間太小因而雌蟲挖

times and width that is at least four times the length of the female it is going to house. If you want to breed all the females in one container, each extra female will require additional bottom dimensions that are half the original one. For example, if you plan to keep five rhinoceros beetle females in one breeding container, and the largest female measures 5 cm, then the minimal dimensions required for the bottom of the tank is (30 + 15 + 15 + 15 + 15 cm) long × (20 + 10 + 10 + 10 + 10 cm) wide. Giving females enough space to oviposit is very important. If a container is too small a female will constantly run into the sides, decreasing her desire to deposit large amounts of eggs. Furthermore, too small of a breeding container will increase the chance of a female running over and crushing her own eggs. The height of each breeding container is also very important. If it is not tall enough to hold a certain amount of substrate the female will refuse to lay even a single egg. The height

組合後。
After assembly.



別忘了加蓋。
A secure top is a must.



掘時經常被飼育容器的四壁阻擋，其產卵量將會大大地降低。除此之外，太小的容器也會導致雌蟲在重複的產卵過程中，把先前產下的卵粒給壓破。產卵容器的高度也非常重要。若腐植物深度不夠，雌蟲是一粒卵也不會生。為了能夠存放足夠高度的腐植物，飼育容器必需至少有1隻雌蟲全長的5倍高。腐植物應至少有1隻雌蟲全長的3倍深。

接下來該注意的是腐植物的濕度。其濕度與飼育上的勝敗有密不可分的關聯。若是腐植物過於乾燥雌蟲不會產卵。反之，若是濕度過高，產下的卵粒很容易發霉爛掉。我測試腐植物濕度是否適中的方法如下：用大姆指和食指抓起一小把腐植物。接著用力壓擠。壓擠時若有水跡出現但又不會滴出來，濕度便很適中。如果壓擠時完全沒有水跡，表示腐植物過於乾燥。以數據而言的話，大約是水和完全乾燥的腐植物以一比一的重量比例混合。腐植物完全乾燥時，最簡單的補水方式並不是用噴霧器，而是直接倒水至腐植物中，然後用湯匙攪拌至濕度均勻。用噴霧器會導致

of each breeding container should be at least five times the length of the female it is going to keep. The depth of the substrate should be at least three times the length of the female.

The next thing to worry about is the humidity level of the substrate. If it is too low a female rhinoceros beetle will refuse to oviposit. On the other hand, if it is too high, eggs will rot. I use the following procedures to check the humidity of the substrate: first, use your thumb and forefinger to pick up a small amount of the substrate. Second, squeeze hard. If you see trace of water between your fingers without dripping, the humidity level is perfect. If you see no water when you squeeze, it is too dry. In numerical terms, it translates to one part water mixed with one part completely dry substrate by weight. The best way to moisten completely dry substrate is not with a spray bottle. This method will cause the water to leak to the bottom of the substrate and form a pool. The best way is to pour water into the substrate and mix with a spoon until the right humidity is achieved throughout the substrate. After the substrate is ready, make sure some branches are added to the top. The purpose is to provide the adults with climbing surfaces, as the substrate is not solid enough for the adults to grasp. If nothing is added, a turned-over adult beetle will never be able to get back to its up-right position. If not helped in time, victims wave their legs helplessly in air until total exhaustion and death set in.



←兜蟲產卵環境。圖中為赫克力士長戟大兜蟲。2002
Rhinoceros beetle breeding tank. Pictured are *Dynastes hercules hercules*



腐植物上下層水分不均勻。產卵用的腐植物準備好後，一定要在其表面放置一些樹枝。目的是為了讓成蟲在空曠的飼育箱中有攀抓的表面。若不添加，一旦成蟲不小心翻到背面便再也無法自己翻回來。有些個體為了翻回來甚至還會掙扎至死！在腐植物表面擺放足夠的攀抓物是不可忽略的。

以上的必需品都準備好後便可以把成蟲放入飼育箱中。若確定雌蟲已交配過可以不必在產卵箱中放入雄蟲。如果不確定則在箱中飼養1隻雄蟲。接著只要每隔2、3天換一次水果以及過分乾燥時補給一些水分即可。當腐植物表面看起來相當乾燥時便是補水的時候。補充時用噴霧器噴霧至腐植物表面不再乾燥即可，千萬不要過分補水。由於腐植物內層保水能力佳，過分補水會導致底部積水。適合飼養及飼育兜蟲和鍬形蟲的地點為不會被太陽曝曬到又通風良好的地方。

放入飼育箱幾天後，雌蟲大多就會開始產卵。要怎麼樣才能知道雌蟲是否已經開始產卵呢？最簡單的方法是把飼育箱拿起來，看底部有沒有卵粒。當然了，此方法僅限用於底部透明的飼育箱。如果使用的飼育箱底部不是透明的，可用以下的方法來判斷雌蟲是否有產卵：首先看原來表面平坦的腐植物是否變得坑坑洞洞，像是被嚴重翻挖過似的。如果是，接著把手伸進去腐植物中。若腐植物的內部摸起來也相當堅硬，雌蟲便已經開始產卵。以上

Therefore, you must not forget to provide grasping materials in a breeding container.

If a female has already mated, there is no need to place a male into the breeding container. But if you are not sure, keep a male with her. Feed every two to three days and moisten the substrate with a sprayer when the surface appears dry. Spray just enough to moisten the surface. Decayed vegetation retains moisture well. If you over moisten the bottom of the substrate will become too wet. Keep the breeding tank in a cool and ventilated place.

A female should begin to oviposit a few days after being placed in the breeding tank. The easiest way to confirm oviposition is to look through the bottom of the container for eggs. However, this only works for containers with a transparent bottom. If the bottom is not transparent, the following method can be used to confirm oviposition without disturbing the female. First, look for sinkholes or craters on the surface of the substrate. If they are present, feel the inside with your fingers. If the texture is hard, like it's been packed or compressed, then a female has started laying eggs. The reason the above two steps can be used to confirm oviposition is that females do not just lay eggs randomly. Before laying each egg, a female uses her hind legs to push the substrate backwards until everything behind her is tightly compressed. Only then does she extend her ovipositor to lay one egg. After the egg is laid, she continues to compress more substrate around the egg so it is well protected. It is exactly because the



的方法可以用來判斷雌蟲是否有產卵，是因為雌蟲並非只是很隨便地把卵產在腐植物中。產卵的過程其實是相當費時的。產卵時，雌蟲會很努力地用後腿把腐植物一直往後推。當後方的腐植物已經被壓得很硬時，雌蟲才會伸出產卵管然後產下一粒卵。接著雌蟲再繼續把身旁的腐植物往後推，直到產下的卵粒已經很安全地被包在堅硬的腐植物中。正是因為雌蟲的向後推擠，正上方的腐植物才會因為下面已沒有支撐物而倒塌，呈現表面有坑洞的現象。也正是因為雌蟲的用力推擠，內層的腐植物摸起來才會硬梆梆的。經過雌蟲幾天的推推擠擠後，通常整個腐植物的表面看起來都會像月球表面一樣，坑坑洞洞的，一眼就看得出來。不止獨角仙，幾乎所有的兜蟲都是以這種方式產卵。至於卵數，獨角仙大約產40粒（有些個體可以產超過100粒）。一旦確認開始產卵，兩個星期後便可以開始收集卵粒。為什麼要收集卵粒？讓牠們自然地在飼育箱中成長不好嗎？這是因為飼育容器的空間畢竟有限，若不將已產下的卵粒先取出，雌蟲很有可能在繼續產卵的過程中把牠們弄破。因此，若是想要有很高的卵量，必需每兩個星期採卵一次。雖然這個問題可以用超大型的飼育容器解決，但是相對地也需要超大量的腐植土，管理起來相當不便。

最佳的採卵方式並不是直接往腐植物裡頭挖。這麼做很容易弄傷卵粒。最簡單又安全的方法是把整缸的腐植物一口氣倒到報紙上。倒出來後會發現成塊

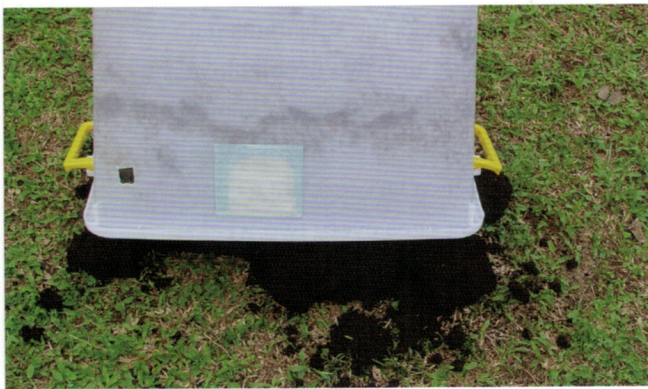
female has pushed away the substrate underneath that the substrate on the top collapses, forming craters or sinkholes. It is also because of the female's compressing activities that the substrate feels hard. A few days after a female has started laying eggs, the surface of the substrate will look like the surface of the moon. Each female *A. dichotoma* lays about 40 eggs (some individuals oviposit up to 100 eggs). Once you have confirmed oviposition, prepare to collect the eggs after two weeks. Why not leave them alone to develop naturally? The reason is that in a limited space, the female will run over her own eggs as she packs the substrate again to lay new ones. Although this problem can be solved by housing the female in a giant container, it is not practical. Unless getting the maximum number of larvae is not a concern, it is best to collect eggs every two weeks.

The best way to retrieve the eggs is not digging into the substrate. Such practice easily damages eggs. The best way is to dump all the substrate onto newspaper. When everything falls out of the container, you will notice that the substrate is in clumps. It is because all the eggs are protected by the compressed clumps that dumping them out does not hurt them. To retrieve the eggs, gently break the clumps apart. (Egg laying is a very energy-draining process for the female. The hobbyist can assist her by compressing the bottom five centimeters of the substrate for her. However, the drawback is it becomes harder to tell if the female has begun to lay eggs.)

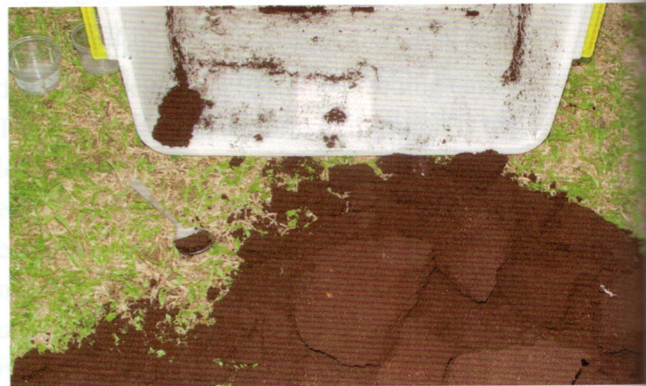


狀的腐植物。這些便是雌蟲在產卵過程中所推擠出來的傑作。就是因為所有的卵粒都被保護在硬塊中，因此把整缸的腐物倒出來也不怕傷到牠們。接下來只要用手小心地把這些硬塊剝開，便可以看見米白色的卵粒。(產卵是非常消耗雌蟲體力的。不過有一個方式可以助雌蟲一臂之力，那就是放入雌蟲前，先用擠壓棒把飼育容器底部5 cm的腐植土壓緊。但這麼做的缺點是外觀上比較看不出雌蟲是否已經產卵。)

Humidity is vital to the eggs. A few days after being laid, an egg will increase its volume to two to three times the original by absorbing water. As soon as an egg is uncovered it should be placed immediately into a previously prepared nursery container. The following are instructions on how to prepare such a container: first, find a small plastic cup and fill it half way with substrate. Second, for each egg retrieved, use a chopstick or pen to make a small indentation about the



↑ 倒出所有腐植物。2005
Dump out all substrate.



↗ 發現硬塊。2005
Substrate in clumps.



↗ 兜蟲雌蟲產卵時推擠出來的硬塊。1997
A block of tightly compacted flake soil. Rhinoceros beetle females compact the substrate to protect their eggs.



↗ 將硬塊剝開、發現雪白卵粒。2006
Egg in clump.



↗ 極罕見一室雙卵。2007
Extremely rare two eggs in one chamber.

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2007
two eggs
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水分對卵粒是最重要的。在整個卵粒的發育過程中，就是因為水分的關係卵粒才得以慢慢地膨脹到原來3倍的大小，然後孵化。因此，一旦取出卵粒後，就應迅速地將其淺埋在一個之前已經準備好的小容器。此小容器的準備方法如下：找一個小的塑膠免洗杯，然後在裡頭裝大約其高度一半的腐植物。接下來每找到一顆卵，便用筷子的頭，在杯子中的腐植物挖個跟卵粒直徑差不多的小洞。挖好後用湯匙小心地把卵粒放入此洞。以大約1 cm做間隔，當一個杯子已經被多顆卵粒飽合時，小心地把這些卵粒用大約3 cm厚的腐植物輕輕地蓋起來。最後用一張保鮮膜和一條橡皮筋把小杯子的洞口封起來。為了讓卵粒能夠呼吸，必需要在保鮮膜上用牙籤戳大約10個小洞。採卵完畢後把含有卵粒的小杯子放在沒有陽光、沒有螞蟻、以及22至26°C的通風處。不只獨角仙，所有的兜蟲也都用相同的方法取卵。



↑ 由左至右：卵粒的發育情形，暗橘色為死蛋。2005
Left to right: egg development. Brownish egg dead.

size of the egg on the surface of the substrate and place the egg into it. Third, with a space of 1 cm between each egg, when a nursery container is saturated, cover all the eggs up very gently with about 3 cm of substrate. Fourth, seal the cup with a piece of plastic kitchen wrap and poke out about ten small breathing holes with a toothpick or needle. Fifth, place the nursery container in a dark, ant-free, and ventilated area with a temperature range of 22 to 26 degrees Celsius.

A. dichotoma eggs take 7 to 14 days to hatch. Whether seven or fourteen days, *A. dichotoma* has the shortest egg duration of all the rhinoceros beetles featured in this book. In the other species, the shortest egg duration is one month, with some lasting seven months.

As an egg matures, the larvae's jaws and breathing holes, or spiracles, become increasingly visible through the shell. When ready,



↗ 將取出的兜蟲卵放置於之前準備好的小容器。1997
Place the retrieved eggs in a previously prepared container.



依溫度而定，獨角仙的卵7-14天孵化。但不管是7天或是14天，跟以後會介紹的各種兜蟲的卵期比起來，都算是破天荒地短。其他種類中，卵期最短的也要一個月，有的更甚至可長達7個月。

所有兜蟲的卵都一樣，在快要孵化的時候，卵殼會變得非常薄。此時可以清楚地看見在卵殼裡頭身體呈「C」狀的幼蟲、其每邊各9顆的氣孔、以及呈深紅色的大顎末端。當孵化的時刻來臨時，幼蟲會弓起背部撐破卵殼。

剛孵化的幼蟲稱為「一齡幼蟲」。

the larva arches its back to rupture the membranous eggshell.

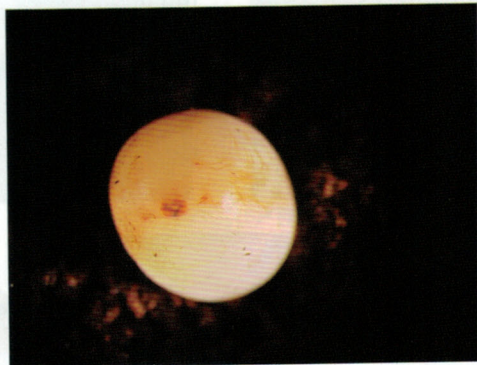
Newly hatched larvae are called “first instar larvae,” or “L1 larvae.” Other than the tips of their jaws, newly hatched larvae are completely white in color. But several hours after hatching, their heads and spiracles start to darken. A day or two later, they become reddish brown. The appearance of dark color signifies the hardening of their exoskeletons, which further signifies that the larvae can start feeding.

Because *A. dichotoma* larvae grow extremely fast, it is necessary to remove them

↓ 正形成中的幼蟲。2002
Developing larva.



↘ 即將孵化、可見大顎。2002
Ready to hatch. Mandibles visible.



↘ 破卵瞬間！2002
Moment of hatching!



除了大顎尖端是深紅色的以外，全身都是乳白色的。但幾個小時後，頭殼和氣孔的顏色開始加深。1-2天後，兩者的顏色變成紅褐色。(每種兜蟲的幼蟲一齡時頭殼的顏色都差不多，二齡開始不同，三齡明顯不同。) 頭部和氣孔的變色代表幼蟲各組織已經硬化，可以開始進食。

由於獨角仙的成長速度非常快，因此孵化幾天後，便需要把牠們從原來的

from the nursery container no later than one week after they hatch. Although *A. dichotoma* larvae are not cannibalistic and can be kept in rather high density, I always give them plenty of space so they can live comfortably. Rhinoceros beetle larvae usually settle on their sides and curl into a “c” shape at the bottom of the container.



↗剛孵化、全身乳白的兜蟲幼蟲。此時的幼蟲相當脆弱，若要捉拿務必小心。1996

Newly hatched larvae are completely white. At this time the larvae are very soft and must be handled with great gentleness.



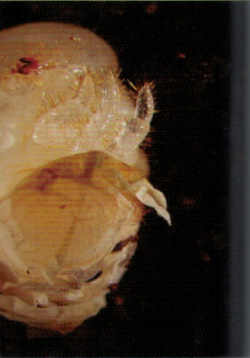
↗頭部橘色、已開始進食的一齡兜蟲幼蟲。1996

Once the head is colored, the larva starts to feed.

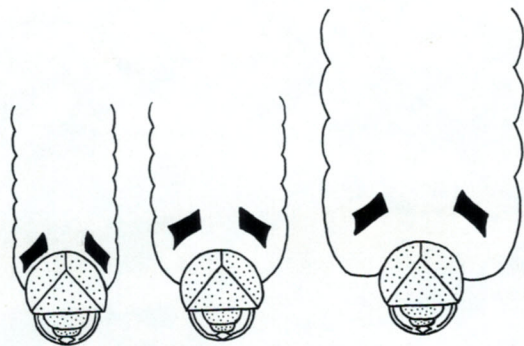
小杯子內轉換到較大的容器。獨角仙算是可以高密度飼養的種類，因此飼養時不必擔心空間不足而打起來。但我個人飼養牠們時，一定給予每一隻幼蟲足夠的活動空間。幼蟲一般都是呈「C」狀平躺於飼養容器的最底部。移動時幼蟲也只是在底部移動，很少會上下移動。因此飼養幼蟲時，最重要的空間是容器底部的面積。我給予每一隻三齡中期以後的幼蟲的底部面積，為其平躺時所占面積的八倍。例如，如果一隻幼蟲平躺時所占的面積大約是一個10元硬幣的大小，那我給予此幼蟲的面積則大約是8個10元硬幣的大小。至於深度，不管一個容器內有養多少幼蟲，腐植物的深度應至少有一隻幼蟲身體厚度的5倍深。不過由於三齡中期之前的幼蟲成長非常迅速，體型幾天內便會超出以上的1比8底部面積，因此直到幾乎達到最高體重之前，幼蟲最好飼養於大約1比20的面積中；腐植物的深度應至少有一隻幼蟲厚度的10倍高。除了會互相殘殺的種類以外，飼養兜蟲幼蟲時，我很建議使用以上的空間規劃方法。

They usually move horizontally. Very rarely do they go up in the substrate. This means the most important space for them is the bottom of the rearing container, not the depth of the substrate. I give each full-grown larva an area that is about eight times the size of the larva when it is curled up. For example, if a full-grown larva in its "c" shape takes up an area that is about the size of a U.S. quarter coin, then the bottom of its rearing container should have an area that is at least eight times the size of a quarter coin. For the depth of the substrate, it should be at least five times the thickness of a full-grown larva, no matter how many larvae are kept together in one container. However, young larvae can outgrow the one-to-eight ratio in no time. As a result, they should each be given a bottom area of one-to-twenty ratio until they get fairly close to their maximum weight. The depth of the substrate should be at least ten times the thickness of a young larva. The above formula does not only apply to *A. dichotoma*, but all non-cannibalistic rhinoceros beetle larvae.

2002
hatching!



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container.



↗三齡初期時幼蟲頭部與身體寬度差不多。中期時身體稍微比頭部寬。後期時身體比頭部寬出許多。但是如果幼蟲營養不良，三齡後期時身體與頭部還是幾乎一樣寬度。

For a young L3 larva, its head and "neck" are equally wide. For an old L3 larva, its "neck" is much wider than its head. However, if an L3 larva is poorly fed, it will always have its "neck" about as wide as its head, no matter how old. A male L3 larva that has its "neck" as wide as its head will pupate into a minor for sure.

多久要清除一次糞便，要看飼養容器裝有多少食物以及養有幾隻幼蟲等等。若是用以上所建議的空間來飼養幼蟲，大約1個月清理一次。清理時可用濾網把糞便和仍然可以食用的腐植物分開。首先在地上鋪上一些報紙，然後把過濾網放在報紙上。接著把飼養容器內的一切倒在濾網上。幼蟲用湯匙挑出、放回容器後，便可以抖動濾網把腐植物和糞便分開。最後將過濾過的腐植物倒回飼養容器並添加新的腐植物。如果腐植物的庫存量相當足夠，又嫌過濾糞便太過麻煩，清理時可將舊的腐植物連同糞便丟棄。(如果清理時選擇過濾糞便，有一點要注意。一般而言，含有水分又暴露在氧氣中的腐植土，大約在4-6個月後會變成沒有營養價值的土壤。也就是說，如果選擇每次換食物後都把篩剩的食物再回收，最久每4個月都應該把所有的腐植物換成全新的。這麼做一來可以防止食物的過度老化，二來可以防



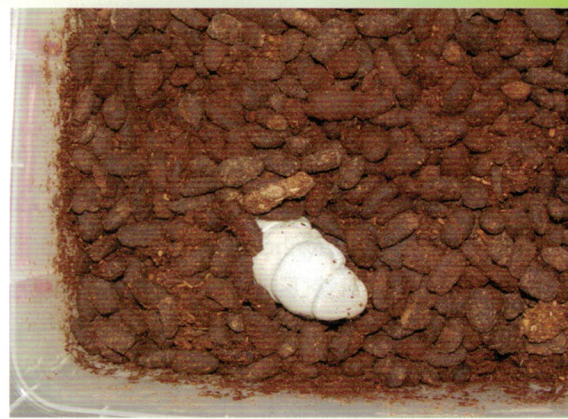
↗三齡中期的獨角仙幼蟲。1995

An L3 *Allomyrina dichotoma* larva that is between the young and old stage. After a few more weeks, this larva will become yellow and have a body that is even thicker.

How often to change the substrate depends on factors such as how much substrate the rearing container contains and how many larvae are kept in it. If using the previously mentioned formula to keep larvae, changing the substrate once a month is ideal. When performing a substrate change, I recommend using a filter. This way you discard only the excrements, and save what is still usable. First, gently dump everything onto newspaper. Two, return the larva to the rearing container. Three, run the substrate through the filter. Fourth, return edible substrate to the rearing container. Fifth, add new substrate to the container. (There is one thing to keep in mind, though. Normally speaking, flake soil that's exposed to both oxygen and moisture will become dirt in 4-6 months. In other words, if flake soil is recycled after substrate change, there should be a total substrate change every 4 months. This practice prevents over-aging of substrate and pathogen



↑ 洗菜用的籃子用來過濾幼蟲糞便相當好用。
Trays with holes are great for screening out fecal pellets.



↘ 太多糞便了！應該要早點換腐植物。2007
Too much fecal pellets! Substrate change should be done earlier.

止病原的累積。另外一個幫幼蟲換食物時，應該養成的好習慣則是不要徒手觸碰幼蟲，最好是全程戴橡皮手套或是使用湯匙，若要更講究的話甚至可以戴上口罩。這是因為人類的皮膚或是口氣中都帶有大量的細菌，有可能對幼蟲造成傷害。)

之前提到獨角仙的一生跟其他兜蟲的比起來是相當短暫的。從孵化到脫皮成二齡幼蟲，獨角仙的一齡幼蟲期只需約12天，而其他的種類中最快的也都要一個月。獨角仙的二齡幼蟲期大約20天。繼第二次脫皮後，獨角仙只需50天左右就可以長到最高體重。換句話說，獨角仙的幼蟲孵化90天後就不太會再增重了。從孵化至化蛹，獨角仙大約需要10個月的時間。雖然獨角仙的幼蟲孵化3個月以後便會達到最高體重，但此時至化蛹的前2個星期仍會不停地進食。

雖然我所養過的獨角仙從孵化到化蛹只需10個月的時間，但住在美國亞利桑納州的好友卻養過20個月以後才化蛹的個體。如此長的幼蟲期可能與食物以及溫度有關。當兜蟲的幼蟲開始接近最

buildup. Another good habit is not to touch larvae with bare hand. It is best to wear gloves or use a spoon. Some hobbyists even wear a mask when performing a substrate change. This is because the human skin and breath contain large amounts of bacteria that could harm the larvae.)

L1 stage of *A. dichotoma* lasts about twelve days. L2 stage lasts about twenty days. Once an *A. dichotoma* larva molts to third instar, it takes another fifty days or so to achieve maximum weight. In other words, about ninety days after hatching, an *A. dichotoma* larva will no longer gain weight. But this does not mean that a larva will no longer feed. In fact, it will continue to feed, although without gaining more weight, for the next six to seven months.

When a rhinoceros beetle larva gets close to achieving maximum weight, its color changes from the original milk white to light yellow. A few weeks after achieving maximum weight, the color changes again from light yellow to deep yellow. *A. dichotoma* larvae kept between 22 and 26 degrees Celsius begin pupation when they are about



高體重時，其身體的顏色會開始由白色轉為淡黃色。當由淡黃色再轉為深黃色時，代表幼蟲已經不會再增重。在22至26°C的持續飼養下，從淡黃變為深黃大約要幾個星期的時間。顏色深黃的幼蟲又被稱為「老熟幼蟲」。大約在三月中到三月底時，獨角仙的老熟幼蟲會停止進食然後開始製造蛹室。而所謂的蛹室是幼蟲用頭胸部推壓出來準備化蛹的橢圓形空間。雖然還在進食的幼蟲也會在類似橢圓形的空間中進食，但此空間跟真正的蛹室差別頗大，因此不用擔心搞混。最大的差別是進食中所製造出來的空間相當粗糙，但真正的蛹室表面卻相當平滑。

一般而言，兜蟲的蛹室都傾斜至少20度。幼蟲做好蛹室後會以頭上尾下的

ten months old. Before pupation, all rhinoceros and stag beetle larvae construct a “pupal cell” (also known as “pupal chamber”). The purpose is so a larva can pupate without having substrate falling on it. To make one, a larva uses its flat head to push and rub against the nearby substrate until a very smooth and oval chamber is formed.

Rhinoceros beetle pupal cells are inclined at least 20 degrees. The larva sits with its head on the higher end for a few days. A larva in this period is called a “pre-pupa.” For *A. dichotoma*, this period lasts about ten days. During the pre-pupa stage, everything in the larva’s digestive system is excreted and a new layer of skin begins to form under the old one. With all the stuffing gone, a larva in this stage is like a balloon depleted

兜蟲化蛹前會做一個稱為「蛹室」的橢圓形空間。圖為蛹室中的高加索大兜蟲前蛹。1998

Rhinoceros beetles make an oval space called the “pupal cell” before pupation. Pictured is *Chalcosoma caucasicus* pre-pupa in pupal cell.



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姿勢在蛹室內靜靜地待上幾天，直到化蛹。這段期間的幼蟲被稱為「前蛹」。以獨角仙而言，前蛹期大約為10天。在這段期間，幼蟲會把體內所有的糞便排出。由於體內突然少了許多填充物，幼蟲看起來像是洩了氣的氣球一般，全身變皺，體重也大大地下降。當糞便全部被排完後，幼蟲的肛門會流出少許的濃稠黑色液體，並且帶有些許的異味，這是正常現象，請不用擔心。大約從做好蛹室的第5、6天開始便可以看見幼蟲背面的內部有隱隱約約的橘色花紋。那便是蛹的腹部背面的花紋。此時的幼蟲完全失去爬行能力，並且六隻腳向上翻翹。此時如果觸碰幼蟲，牠便會激烈地原地轉圈圈扭動。大約就在做好蛹室的第十天，幼蟲的舊表皮與蛹的新表皮不再有連繫。此時化蛹即將開始。

對我而言，每一次多月，甚至多年的等待都是為了化蛹這一刻。每當一隻幼蟲化蛹並長出巨大犄角時，我都是一種無法形容的成就感。如果化蛹的是

透過舊表皮可見類似波浪狀的花紋，為蛹腹部背面的花紋。此高加索大兜蟲前蛹距離化蛹只有幾小時。1998

The wave-looking marks seen through the larval skin are the marks on the dorsal side of the abdomen of the pupa. This *Chalcosoma caucasus* pre-pupa is only hours from pupation.



of air: wrinkled and somewhat flat. The larva's anus oozes out a small amount of thick black liquid with a funny odor. For *A. dichotoma*, about six days after the pupal cell is formed, various lines and patterns become obvious through the old skin. What you see are parts of the pupa. At this point, a rhinoceros beetle larva has totally lost its ability to dig or crawl. If you touch a pre-pupa, it will swirl helplessly. On about the tenth day, the old epidermis on the back splits, marking the beginning of pupation.

When a rhinoceros beetle pupa first emerges from the old epidermis, it is completely soft, wrinkled, and white in color. Once completely out of the old skin, a pupa continuously swirls its abdomen to get its blood, or hemolymph, pumped to every part of the body. The originally wrinkled parts, especially the horns, start to inflate and take form. When this process is finished, the pupa



兜蟲前蛹的狀態都一樣，不外乎是體重明顯下降、失去活動能力、六肢在第二節處往上翻翹，以及尾端嚴重變皺。圖為美西白兜蟲前蛹。1998
 Rhinoceros beetle pre-pupae lose weight, become immobile, have their six legs sharply bent at the second joint, and become very wrinkled. Pictured is *Dynastes granti* pre-pupa.



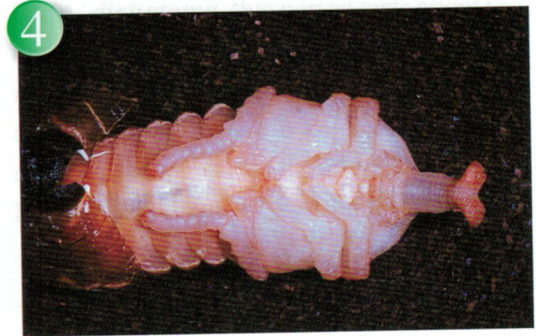
1 化蛹開始，可看見氣孔之間有白色條狀物，為氣管表皮。1995
Beginning of pupation. White stripes between spiracles are tracheal skin.



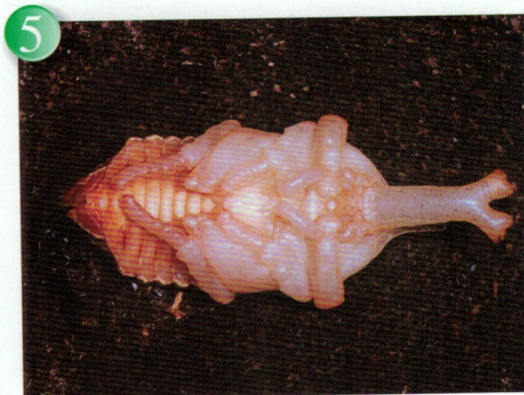
2 舊表皮於背部裂開，蛹的頭部與胸部出現。
The larval skin ruptures on the dorsal side. The head and thorax appear.



3 頭部與胸部完全脫出，此時的犄角又小又皺。
The head and thorax are completely out of the larval skin. At this time, the horns are small and wrinkled.



4 頭部、胸部、及腹部完全脫出，且犄角基部開始膨脹。
The head, thorax, and abdomen are all out. The base of the cephalic horn is starting to inflate.



5 全身光滑，犄角完全成形。
The entire pupa is now smooth, with both horns completely formed.



6 幾小時後顏色由原來的白色變為橘黃色。
A few hours later the color of the pupa changes from milk white to orange-yellow.

一隻特大型雄蟲，我更是會陶醉得不亦樂乎。這也正是為什麼對我而言，只要是活的，再有瑕疵或再小型的個體都一樣是最好的。因為只要加以細心地飼養其後代，難道我不能夠養出更多、更漂亮，以及更大型的個體嗎？何必因為採集不到無瑕疵或是大型的野生個體而懊惱呢？剛化蛹時，蛹的全身為乳白色，而且又皺又軟。脫出舊表皮後，蛹會不斷地扭轉腹部。此動作會將體內的血液充灌至全身，讓原本充滿皺摺的前半段像氣球似地鼓起來。就在此時，剛脫皮時還不顯眼的犄角被充分地表現出來。當新蛹的外形已經完全因血液的充灌而發展成成蟲的外形時，其顏色便會開始由原來的乳白色慢慢加深至橘紅色。而這個變色的過程只需短短的幾個小時。化蛹之後的獨角仙需要再過19-21天才會羽化。蛹的發育很好觀察。只要透過燈光仔細觀察，便可以看見每一個部位的形成過程。就在羽化前的1-2天，蛹皮裡頭的成蟲，每幾分鐘便會稍微活動其爪子，看起來就好像即將要復活的木乃伊。一旦羽化時刻來臨，在蛹皮裡頭養精蓄銳已久的成蟲便會用六隻腳狠狠地將蛹皮推破，接著爬出。剛爬出蛹皮的成蟲翅鞘為乳白色，但其他部位大部分都已是獨角仙成蟲的黑色、褐色、或紅褐色。就和蝴蝶及蟬一樣，所有兜蟲羽化時也需要展翅。為了展翅，剛羽化的成蟲會把後腿墊高，好讓後翅有足夠的空間伸展。一開始時，後翅也是又皺又小。但是同樣因為血液充灌的關係，原來嬌小的後翅到最後變得又大又平坦。

looks very much like an adult beetle, with all the legs and horns conspicuously formed. Also at this time, the color of the pupa starts to darken, becoming orange red after a few hours. After pupation, an *A. dichotoma* pupa needs an additional nineteen to twenty-one days to become an adult. The development of a pupa can almost be seen on a daily basis. All you have to do is very carefully hold a pupa in front of a light bulb. With light rays penetrating the transparent pupa, you can see all the different parts forming inside. Finally, just a day or so before eclosion, the beetle inside the pupa rhythmically exercises its claws every few minutes, signifying that eclosion is not too far away. When ready, the beetle pushes all six legs forward synchronously to break open the pupal epidermis. This signifies the beginning of eclosion. When a rhinoceros or stag beetle adult first crawls out of the pupal skin, the entire wing covers, or elytra, are slightly wrinkled and white in color, although most other parts have already taken the mature color. The flight wings at this time are wrinkled and small. Like butterflies and cicadas, a newly-eclosed rhinoceros beetle extends its flight wings with hemolymph. The beetle's abdomen is elevated from the ground, giving room for wing expansion. Fully extended wings are smooth in appearance and many times bigger than the original size. A newly-eclosed rhinoceros beetle rests with its flight wings fully extended for a few hours. When the wings harden, it carefully folds them underneath the elytra, making them no longer visible from the outside. A few days later, the elytra finally take the mature color.



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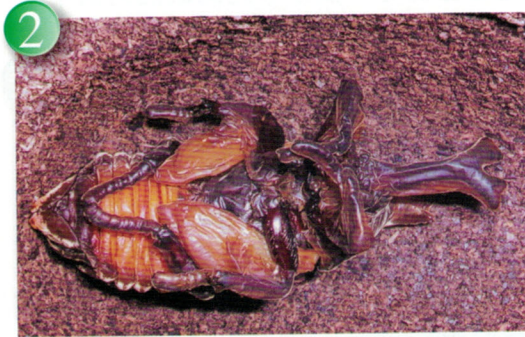
接著成蟲會花上3-4個小時讓後翅硬化，然後很小心地把其摺疊於翅鞘之內。

羽化後的成蟲會繼續蟄伏於蛹室內10-14天，好讓各身體部位完全成熟。成熟以後，成蟲便會挖破蛹室爬至地面，然後起飛去尋找植物汁液或是交配對象。如果將還未成熟的成蟲從蛹室內挖出，牠並不會進食或飛行。若將新成

Young *A. dichotoma* adults will continue to stay in the pupal cell for ten to fourteen days, allowing its various body parts to completely harden and mature. Once completely mature, a rhinoceros beetle adult digs through the pupal cell to emerge to the surface and takes off into the air to look for food sources and mates. If an adult is taken out of its pupal cell before it's mature, it will neither feed nor fly. If you dig out any new



1 化蛹19天後即將羽化的蛹，此時的蛹表皮變得很皺，也可清楚地看見蛹表皮裡頭的成蟲。
19 days after pupation the adult is ready to eclose. At this time the pupal skin is very wrinkled and you can see the adult very clearly through the pupal skin.



2 破蛹一剎那！已等待多時的成蟲終於狠狠地把蛹皮踢破。
The adult is ready! He pushes his six legs forward to break open the pupal skin.



3 爬出蛹皮一半的新成蟲，可看見翅鞘仍是白色的。
He is now half way out of the pupal skin. You can see that his elytra are completely white.



4 展翅中。
Spreading wings.



蟲從蛹室中挖出觀察，記得之後再將其埋於10-15 cm深的微濕、任何腐朽程度的木屑中，直到其自己爬至表面活動。獨角仙的飼育介紹，到此也該告個段落了。現在將開始介紹其他國家的大型兜蟲及其飼育方法。獨角仙的飼育可以說只是熱身運動！

adult to observe, remember to bury it back in 10-15 cm of substrate afterwards. No feeding is necessary until the adult emerges to the surface.



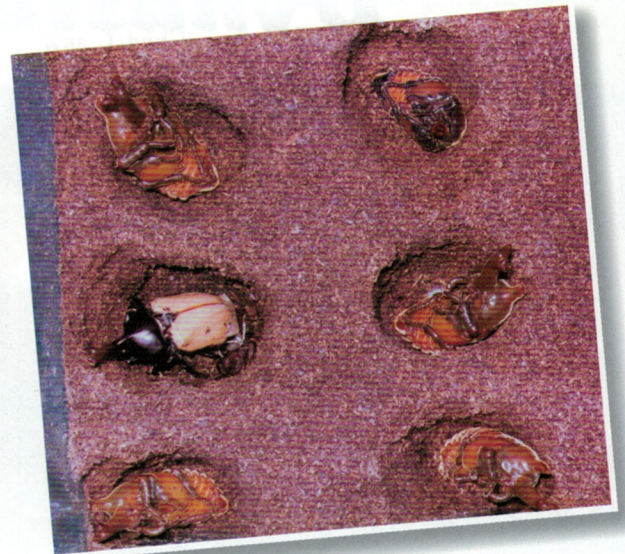
5 翅鞘顏色變米黃，此時的內翅也變得比較堅硬，不久後便會收翅。
The elytra are now cream colored. At this time the hind wings have also become tougher. The adult will fold them under his elytra very soon.



6 已收翅，翅鞘顏色加深為暗橘。
The hind wings have already been folded. The elytra are now orange colored.



7 羽化2天後翅鞘顏色完全成熟。
Two days after eclosion the elytra take the mature color.



一群坐躺於人工蛹室內的獨角仙蛹與新成蟲。1995
A group of *Allomyrina dichotoma* pupae sitting in artificial pupal cells.