

呼吸孔。起先飼養容器不用太大，底部直徑8 cm、高度10 cm左右（體積約500 cc）就夠大了。接下來用擠壓棒把發酵朽木屑壓緊於容器內。擠壓時容器底部一定要墊一塊布，否則玻璃破掉是很危險的。壓到8分滿後在表面挖一個放幼蟲的小洞。幼蟲放入後用原產卵木的木屑輕輕地把洞口填起來。蓋好蓋子後，將飼養容器直立擺置於15-26度的通風陰暗處。幼蟲耐寒力很強，就是連寒流來襲都完全不用擔心，但是溫度越低幼蟲成長得就越慢。最適合幼蟲的溫度為22-25度。經過3個月的飼養後，透過透明的容器可看出幼蟲明顯比剛從產卵木中取出時大出許多。此時一定要用更大的容器飼養，否則空間絕對不夠大型雄蟲化蛹。幼蟲頭殼看起來比較小的通常是雌蟲，可以幫她準備直徑10 cm，高度12 cm的飼養容器（體積約1000 cc）。雄蟲則須直徑12 cm，高度20 cm的飼養容器（體積約2,200 cc）。除了容器變大以外，用的腐植物以及其裝法都相同。幫幼蟲搬家時，把飼養容器倒過來用湯匙很小心地把幼蟲挖出來。這裡我一定要強調，動作一定要很溫柔，千萬急不得，否則幼蟲很容易被挖傷。接著每3-4個月



lid back and store the jar in a dark and ventilated place between 15 and 26 degrees Celsius. *Curvidens* can tolerate extreme cold, but temperature below 15°C will slow larval development. Three months later, the larva will be considerably bigger. At this time, a larger container is needed or pupation will be a problem. Larvae with a smaller head are usually females. These can be transferred to a container 10 cm in diameter and 12 cm in height (1,000 cc). Male larvae should be transferred to a container 12 cm in diameter and 20 cm in height (2,200 cc). To retrieve the larva, turn the container over and dig very carefully with a spoon. Perform a substrate change every 3-4 months until pupation.

Stag beetle larvae, like rhinoceros beetle larvae, make a pupal cell prior to pupation. *Curvidens* pupal cells are easy to spot as most larvae make them at the bottom of the rearing container. The pre-pupa period of *curvidens* is 15 to 30 days; the larger a larva, the longer. Pupa period lasts 20 to 30 days. If the temperature is below 20°C, both the pre-pupa and pupa period will extend. Larvae reared with the "flour fermentation method" have a female larval period of 6-12 months and 8-14 months for males.

←用發酵木屑飼養的老熟日本大锹形蟲幼蟲。21 g。2000  
Full-grown *D. c. binodulosus* larva in fermented decayed wood flakes.



換一次飼料，直到幼蟲製作蛹室為止。

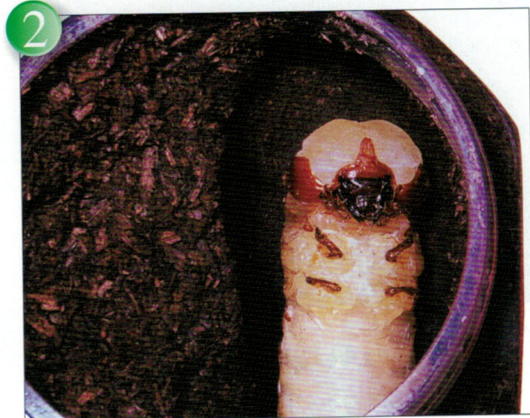
化蛹前锹形蟲幼蟲跟兜蟲幼蟲一樣會先造蛹室。大部分的蛹室都造在飼養容器的最底部，一眼就看得見。其蛹室為很有規律的細長橢圓形空間。

*Curvidens* 大锹形蟲的前蛹期15-30天，越大型者越長。蛹期20-30天，一樣也是越大型者越長。溫度如果低於20度，前蛹期和蛹期都會拉長。以發酵木屑飼養的幼蟲，雌性幼蟲期6-12個月，雄性幼蟲期8-14個月。「發酵木屑飼養法」也

The fourth method is the “kinshi bottle method.” Kinshi bottles are basically mushroom spawn jars. “Kinshi” means “fungal mycelium” (plural mycelia) in Japanese. The following analogy is the best way to understand what a mycelium is: kinshi are like plants; mushrooms are like flowers. Under the right circumstances, plants produce flowers. Similarly, under favorable conditions, mycelia produce mushrooms. The growing medium for plants is soil. The growing medium for mycelium is raw wood or sawdust. In reality, a “kinshi bottle” is al-



1 即將化蛹的日本大锹形蟲前蛹。2000  
*D. c. binodulosus* pre-pupa just minutes before pupation.



2 幼蟲頭殼分裂為三，好讓新蛹脫出。  
The head capsule splits into three to allow the pupa to escape the larval skin.



3 大顎從幼蟲大顎中脫出。不管一隻蛹的大顎有多大，前蛹期時都一定是壓縮於幼蟲的大顎裡，脫出後再由血液充灌變大。

The mandibles coming out of the larval mandibles. No matter how big the mandibles of a pupa are, they are still all compressed into the larval mandibles during the pre-pupa period. After they come out, blood is pumped into them and they enlarge.

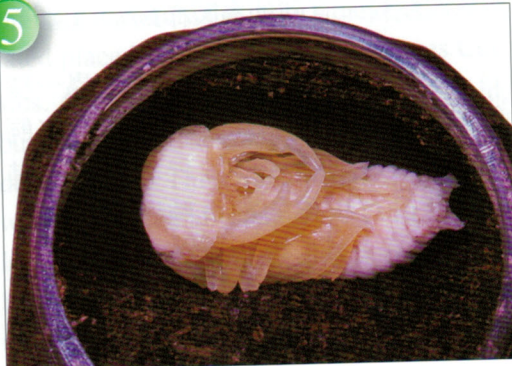


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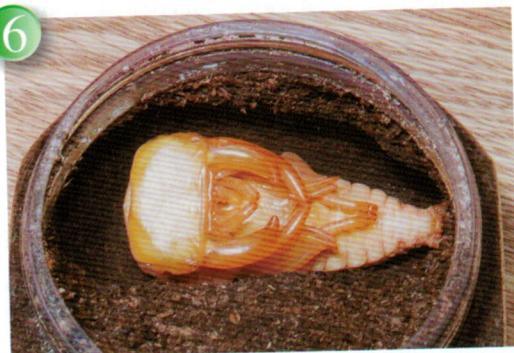
↗大顎完全脫出，此時大顎及頭部均還沒完全膨脹。  
The mandibles completely out of the larval mandibles. At this time they are still not completely inflated.

5



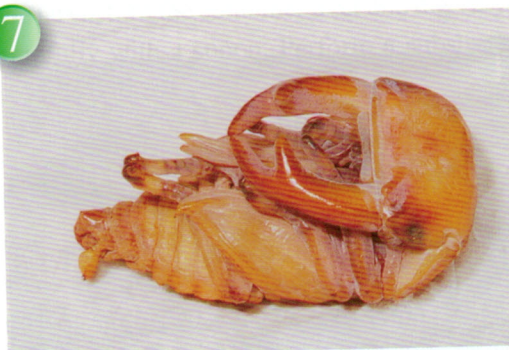
↗完全定型的大型雄蟲。  
Completely formed. What a nice major pupa.

6



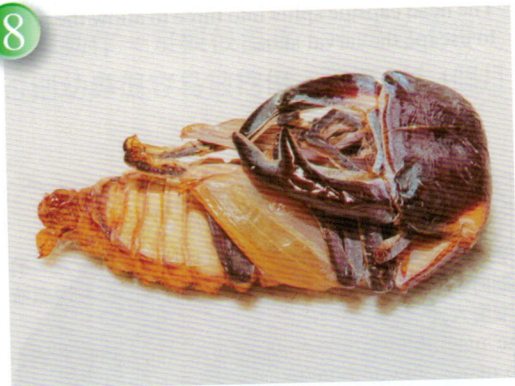
↗10小時後顏色加深。  
Ten hours later the color darkens.

7



↗化蛹20天後，可清楚看見腳爪已形成。  
20 days after pupation. You can see that the claws have already formed inside the pupal skin.

8



↗即將羽化的日本大锹形蟲蛹。可看見蛹皮變得很皺。  
Just minutes before pupation. You can see that the pupal skin is now very wrinkled.

9



↗踢破蛹皮，羽化開始。由於沒有可以讓其翻身的蛹室，我必須親自幫牠翻身，否則會羽化成翅鞘畸形的個體。  
Eclosion time. The adult kicks through the pupal skin. Without a pupal cell to turn over, I turned this adult over to avoid elytral deformity.



10



↗ 努力爬出蛹皮。  
Crawling out of the pupal skin.

11



↗ 完全脫離蛹皮。  
Completely out of the pupal skin.

12



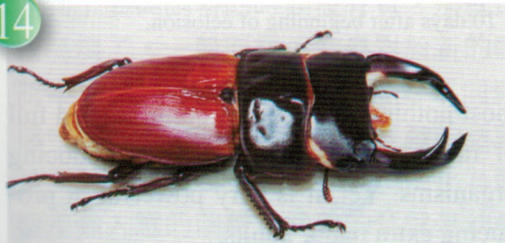
↗ 展翅中。幾小時後頭部才會抬起。  
Spreading wings. It will be a few hours before the head is raised.

13



↗ 開始羽化9小時後。  
9 hours after beginning of eclosion.

14



↗ 開始羽化18小時後。  
18 hours after beginning of eclosion.

15



↗ 開始羽化10天後。71 mm  
10 days after beginning of eclosion.

### 幼蟲最高體重/成蟲尺寸換算表

Max Larval Weight to Adult Size Conversion Table

| 幼蟲最高體重<br>Max Larval Weight | ♂ 成蟲尺寸<br>♂ Adult Size | ♀ 成蟲尺寸<br>♀ Adult Size |
|-----------------------------|------------------------|------------------------|
| 8 g                         | 50 ± 1 mm              | 38 ± 1 mm              |
| 10 g                        | 54 ± 1 mm              | 42 ± 1 mm              |
| 12 g                        | 58 ± 1 mm              | 44 ± 1 mm              |
| 14 g                        | 60 ± 1 mm              | 46 ± 1 mm              |
| 16 g                        | 63 ± 1 mm              | 50 ± 1 mm              |
| 18 g                        | 66 ± 1 mm              |                        |
| 20 g                        | 70 ± 1 mm              |                        |
| 22 g                        | 72 ± 1 mm              |                        |
| 24 g                        | 75 ± 1 mm              |                        |
| 26 g                        | 77 ± 1 mm              |                        |
| 28 g                        | 79 ± 1 mm              |                        |
| 30 g                        | 80 ± 1 mm              |                        |



1 展翅中的日本大锹形蟲雌蟲。2000  
Female *D. c. binodulosus* spreading wings.



2 開始羽化6小時後，正在收翅。  
6 hours after beginning of eclosion, folding wings.



3 羽化14小時後。  
14 hours after beginning of eclosion.



4 開始羽化10天後。44 mm  
10 days after beginning of eclosion.

很有機會養出70 mm以上的雄蟲。

接下來介紹奇妙無比的「菌絲瓶飼養法」。記得1994年第一次在日本東武百貨公司的昆蟲部門看見菌絲瓶時，心裡還笑說他們怎麼幼蟲養到整罐都發霉了還不知道。一直到後來才知道那叫「菌絲瓶」。所以菌絲瓶究竟是什麼呢？其實菌絲跟大家都熟悉的菇類有密不可分的關係。以下的比喻很容易懂：菌絲就好像是植物；菇就好像是花朵。在適當的條件下植物會開花。相同的，在適當的條件下菌絲也會發菇。植物的生長介質是土壤；菌絲的生長介質是還未朽

most nothing more than a bottle stuffed full of raw sawdust and mushroom-producing organisms. Yet, it is very powerful in producing extra major adults.

Here in Taiwan, the easiest way to obtain kinshi bottles is beetle specialty shops. The hobbyist can choose locally-made or Japan-imported products. Both work well. However, locally-made bottles are usually only 1/4th the cost of Japanese counterparts. Furthermore, Taiwanese bottles tend to be fresher and always available. When performing a kinshi bottle change, it is best to



化的生木頭。菇好比菌絲的果實。而菌絲其實就是真菌用來擴展體積的觸角。說穿了，菌絲瓶只不過是裝滿了木屑和菇原體的瓶子。但是它對於養出超大型個體的大锹形蟲卻很厲害。

取得菌絲瓶最簡單的方式，就是到甲蟲專賣店購買。養蟲者還可以選擇日菌或是台菌，也就是日本進口的菌瓶或是台灣自製的菌瓶。其實不管是日菌或是台菌，都能夠養出很好的成績（低死亡率、大型個體），但是要使用日菌或是台菌其實是個人的偏好，初學者可以請蟲店老闆推薦或是上網查詢。就價格方面，台菌通常只有日菌的四分之一。另一方面，因台菌為本地製造，新鮮度以及供應量的穩定度通常都比日菌高。其實使用菌絲瓶有一個重點，那就是換菌瓶的時候最好是使用同公司、同菌種、同樹種的菌瓶。如果使用的是日菌，剛好到了要換飼料的時候沒有貨，那就比較麻煩了。一般而言，幼蟲對於新的菌瓶不會太挑剔，但少數個體對不同菌種、樹種的菌瓶會起反應，輕微的話就是三齡幼蟲拒食，就地化蛹，羽化為體型差強人意的個體，嚴重的話就是幼蟲拒食，爬到表面死亡。但台菌也並非沒有缺點。到目前為止，有些台菌還是菇寮用來生產食用菇的菌絲包，並非特別為甲蟲設計的食材。也因此，有些台菌的含水量偏高，木屑顆粒粗糙，而且含帶樹皮。如果供應量不是問題，通常吃日菌的幼蟲會長得比較快，並且長為極大個體的機率甚高。不過目前已有許多蟲店在積極地開發專門為锹形蟲設計的



菌絲包中的三齡幼蟲。2006  
L3 larvae in kinshi bags.

use a bottle from the same company, with the same kind of fungus and tree. If the beetle shop runs out of Japanese kinshi when you need it, your larvae could be in trouble. If the larva refuses a kinshi bottle, it will either pupate and become a smaller adult or starve to death. However, Taiwanese bottles are not without drawbacks. Generally speaking, Taiwanese bottles are produced by mushroom farms and not specifically made for beetles. They are often too moist. The sawdust are usually coarse and contain bark. If steady supply is not an issue, larvae tend to grow better in Japanese bottles. However, many beetle shops in Taiwan are now in the process of developing kinshi bottles designed specifically for beetles.

When purchasing kinshi bottles, some kinshi may still be in the process of substrate colonization. This is not a problem. A few days later, the bottles will be completely colonized. If not in a hurry, the best time to put a larva into a kinshi bottle is one month after the kinshi have completely colonized.