




↑ 一群正吃蘋果吃得津津有味的美西白兜蟲。大角者65 mm、中角者50 mm、母蟲41 mm。1997
A group of *Dynastes granti* feeding on apple. Major 65 mm, medium 50 mm, females 41 mm.

美西白兜蟲

Dynastes granti



↑ 典型的美西白兜蟲。73 mm。2005
Typical *Dynastes granti*.



我第一次得知有白兜蟲這種生物大約是在1993年。當時是在一本日本童書上看見照片。到了1994年的時候，我有機會和一位居住於亞利桑那州的職業採集者聯繫上，並且向他表達了購買活體白兜蟲的意願。另我相當訝異的是，購買白兜蟲竟然要排隊，而且還要排兩年！採集者透過電話跟我說我排在第六位，以他每年夏天只採得到2-3對的速度，可能要到1996年才輪得到我。當時聽了很失望，可是也只有等了，而且還要先匯款給他。(現在回想起來，真的是很不可思議，購買當今最普遍的白兜蟲當時竟然要排兩年的隊！) 1995年的夏天時，採集者說蟲況還不錯，已經採集到我的母蟲了，再來就等公蟲飛到他的水銀燈。不過當時已經是九月，算是白兜季的尾聲了。有一天他打電話給我，我相當興奮，以為採到公蟲了，結果他說昨晚確實有一隻公蟲飛到他的水銀燈，可是雄蟲一降落就被臭鼬鼠搶走了，他吶喊、丟石頭都沒有用。就這樣，1995年的蟲季結束了，我只收到一隻母蟲，後來也證實是沒有受精的母蟲，因為一顆蛋都孵不出來，不過採集者也沒有收我的錢。好消息是，我現在是名單上的第一位，1996年白兜季的第一對蟲將會是我的。等了兩年以後終於在1996年的七月底採集者寄出了我生平的第一對活白兜，並告知雄蟲是60 mm的超大個體(在那個年代，60 mm確實是超大個體)。我以非常緊張的心情拆開包裹，深怕蟲已在運輸途中發生意外。拆開後發現蟲安然無恙時真的是相當開心，不過仔細檢查以後發現雄蟲的右中腿是跛腳，但是最後證實並不影響交配。

I first knew about the existence of this species in 1993. In 1994, I had the opportunity to get in touch with a collector in Arizona. He told me that there was a waitlist and I was 6th on it. With his speed of collecting two to three pairs per summer, I might have to wait until 1996 to get my pair. I was disappointed, but could only wait. (Now thinking about it, it's unbelievable that one of the most readily available species in today's pet beetle market back then required a wait of two years.) In 1995, the collector told me that it was a good season and he had already collected my female. He was only waiting for a male to fly to his mercury lamp. One day he called and I thought he had collected a male. He said a male did fly to his lamp but a skunk took it as soon as it landed. The 1995 season ended and I only received a female. It later proved that she never mated because none of her eggs hatched. The good news was, I had become first on the waitlist. In late July of 1996, I finally received my first ever *D. grantii* pair. I nervously opened the packaging, with the fear that they might have died during shipping. I was overwhelmed when I saw them safe and sound. Although the male had a lame right middle leg, it was later proven that it would not affect mating.





✓即將交配的美西白兜蟲。♂65mm
♀42mm。1997
A pair of *Dynastes granti* getting ready to mate.



✓嬌小的一齡美西白兜蟲幼蟲。1996
First instar *Dynastes granti* larva.

美西白兜蟲的卵期可能是所有兜蟲中最長的。獨角仙的卵只要10天就可以孵化，但是美西白兜蟲的卵最快的也要1個月才會孵化，而且1個月便孵化的美西白兜卵少之又少，平均都要兩個月才會孵化，有些更是拖到5個月，目前的最高紀錄是7個月。現在回想起來，我要非常感謝馬克馬尼格事先告知我美西白兜的特異卵期，否則不知道會丟掉多少粒卵。根據以往的經驗，每20顆美西白兜蟲的卵裡頭，有1粒會在30天左右孵化，3粒5個月左右孵化。習慣了飼育獨角仙的我，一開始對這超長的卵期真是非常地不習慣。不過後來飼育過多種的兜蟲後，我發現其實是獨角仙的卵期太短了。

幼蟲孵化以後也比獨角仙挑食許多。經過了幾代的獨角仙飼育後，我

D. granti may have the longest egg duration of any rhinoceros beetles. *A. dichotoma* eggs hatch out in ten days. The fastest *D. granti* egg takes 30 days and there are very few such eggs. Most of them take 60 days to hatch. Some take up to five months. The record so far is seven months. According to data, only one out of twenty *D. granti* eggs hatches in one month. Three out of twenty hatch in five months. At first, I was very unused to the unusually long incubation period. But as it turned out, *A. dichotoma*'s egg duration is on the short side.



當時斷定兜蟲幼蟲的養法一定都一樣。但我卻大錯特錯了。有許多種類的幼蟲都有自己特別的需求。幾乎任何腐植物都可以用來飼養獨角仙的幼蟲，但白兜蟲的幼蟲只偏好高腐朽的腐植物。若使用腐朽度不夠的飼料餵食，幼蟲一、二齡時會長得很緩慢；三齡後幾乎不會增重。最後幼蟲不是死亡則是羽化為超小型個體。

在所有腐植物都要自己上山去挖的1990年代，高品質的高腐朽腐植物尤其難尋。這是因為在野外，森林表面附著著各式各樣的植物，一旦一棵樹被真菌分解成軟朽木時，週遭的植物便會迅速地入侵，並把養分給吸收掉。此時的腐植物甚至還會帶有強烈的酸味，已經沒有任何飼育價值。若是用這種劣質的腐植物來飼養幼蟲可以說是必死無疑。除非採集到的腐植土或高腐腐植土是養分還沒被其他植物吸收掉的，否則好不

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已完全被其他樹木根部侵佔的軟朽木。這種朽木的利用價值極低。1997

Soft decayed wood completely invaded by the roots of another plant. Decayed wood like this cannot be used to culture rhinoceros or stag beetles as they have very little or no nutritional values.

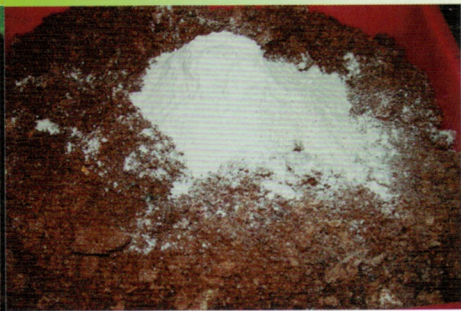
D. granti larvae are much pickier than *A. dichotoma* larvae about the substrate. While *A. dichotoma* thrives on as many as six types of decayed vegetation, *D. granti* only grows well on decayed vegetation with a high degree of decay. If offered improper substrate, L1 and L2 stages will be much prolonged; L3 larvae will not gain weight and eventually become minor adults or die.

High quality decayed vegetation with a high degree of decay such as flake soil is difficult to collect in the wild. As soon as a piece of hard decayed wood becomes soft decayed wood, it is invaded by the roots of nearby plants. By the time the soft decayed wood becomes flake soil, its nutrients have been depleted by the roots. If you take a sniff of the flake soil, a scent of ammonia can be detected. If such flake soil is used to rear any larva, the outcome is death. Unless the collected substrate has not lost its nutrients to



三齡初期的美西白兜蟲幼蟲。此個體脫皮為三齡還不到2天，可看出頭殼仍為鮮豔的紅色。1996

Young L3 *Dynastes granti* larva. This larva molted less than two days ago. The head capsule is still bright red. The color of a mature head capsule is dark brown.



↑加入麵粉。2002
Flour is added.



↗要攪拌到看不見麵粉。
Mix until flour no longer visible.



↘用蓋子或是塑膠袋蓋起來。
因發熱的關係，塑膠袋內面
充滿水蒸氣
Cover with a lid or plastic
sheet. Due to heat genera-
tion, the underside of the
plastic sheet is filled with
vapor.

容易才扛回來的腐植物也是有等於無。既然在野外不容易找到高品質的高腐朽腐植物，而當時的年代又沒有甲蟲專賣店，那該怎麼辦呢？自己做。雖然一般而言，樹木的腐朽過程很費時，但以下的方法卻能在短時間內製作出優質的高腐朽腐植物。此方法叫作「麵粉發酵法」，是日本朋友教我的。麵粉發酵法的功能是將各種朽木屑在短期內更加腐化至腐植土或是高腐腐植土。方法如下：

1. 取得硬朽木、中朽木、或是軟朽木。
只採用以上腐植物是因為它們均還未變成屑狀，所以內部養分都還未被其他生物吸收。若用的是軟朽木，先用手搓揉成朽木屑。若用的是硬或中朽木，少量的話可以用鋸子一層一層地鋸成朽木屑，或是敲成小塊後加水用果汁機打碎。大量的話最好是用碎木機粉碎。朽木屑越細越好。
2. 將至少5公升的朽木屑放入塑膠容器或是寶麗龍箱中，並確認朽木屑的深度至少有5 cm。如果不到此深度則加入更多的朽木屑或是換一個較小的容器。

other opportunistic plants, you might as well not use it at all. If quality decayed vegetation with a high degree of decay is difficult to collect in the wild, what's the solution? Make it yourself. Procedures are as follows:

1. Obtain hard decayed wood, middle decayed wood, or soft decayed wood. Pulverize it. Soft decayed wood can be crumbled by hand. If in small quantities, hard and middle decayed wood can be hammered and pulverized by a blender. If in large quantities, it is best to use a chipper. The finer the flakes the better.
2. Put at least five liters of wood flakes into a plastic or Styrofoam container and make sure the flakes are at least 5 cm deep. If the depth is less than 5 cm, use a smaller container.
3. Make the humidity of the substrate identical to that suitable for rearing larvae. Add flour that is roughly 10% the volume of the substrate. Mix thoroughly. (Do not overdose with flour.)



↓老熟美西盲兜蟲幼蟲。1999
Full-grown L3 *Dynastes granti* larva.

3. 將朽木屑的溼度調至和平常飼養幼蟲時一樣，之後加入大約朽木屑體積10%的麵粉。充分攪拌至看不見麵粉為止。(麵粉千萬不要加太多。)
4. 用戳有透氣孔的蓋子或是塑膠袋把容器蓋起來。封口的主要用意是防止雜蟲的入侵以及熱氣的流失。
5. 把容器放在至少28°C的陰暗處。

從第二天開始，朽木屑便會開始發酵。在發酵的過程中，朽木屑會發熱和產生臭酸味。大約到了第10天熱氣就會退去。此時每天掀開蓋子充分攪拌木屑一次。3個星期後，臭酸味應該就會退去，此時發酵完畢。如果仍有臭酸味或是阿摩尼亞味就是麵粉加太多了。這個時候必須每天攪拌腐植物數次。只要有耐心，有一天臭味一定會退去。在臭味完全退去之前，腐植物絕對不可以用來飼養幼蟲。發酵後的腐植物顏色一定比之前深，而且摸起來也比較軟。如果顏

4. Cover the container with a lid or plastic sheet with ventilation holes. The purpose is to trap heat and exclude pests.
5. Keep the container in a dark area 28°C or higher.

Fermentation begins on the second day. Heat and odor are generated. By the tenth day, heat should subside. Then thoroughly mix the substrate once a day. Three weeks later, the odor should subside, marking the end of fermentation. If foul odor persists, too much flour was added. Mix the substrate a few times a day. With patience, odor will subside one day. Before the foul order diminishes, the substrate must not be offered to larvae. After fermentation, the substrate becomes darker in color and softer in texture. If the color is dark brown, flake soil has been produced. If the color is still light brown, another round of fermentation can be performed. High quality flake soil can easily produce major *D. granti*. The mechanism



色為褐色，在眼前的便是成功的發酵木屑。如果腐朽程度不足，可以再進行第二次發酵。製作好高品質的發酵木屑後便可以輕易地養出大型的美西白兜蟲。麵粉可以加速朽化過程的原理是，朽木屑中本來就含有一定比例的微生物，而這些生物接受到如麵粉的營養源後數量便倍增，導致有更多的微生物可以消化朽木屑。

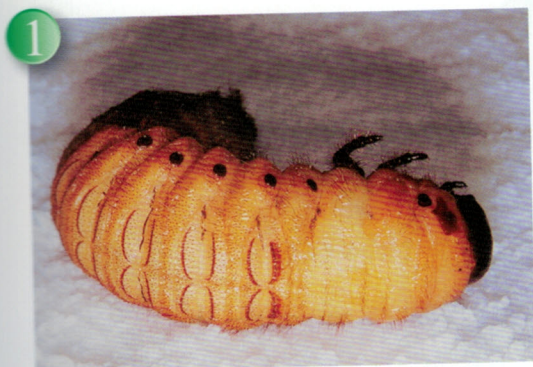
美西白兜蟲從孵化到脫皮成三齡幼蟲大約需要120天。當然此數字並不絕對。若給予的營養不足，此時間則會再拉長。三齡初期到最高體重需要大約60天，之後要再12-14個月才會化蛹。美西白兜蟲從卵至羽化總共需要2年的時間。這讓獨角仙的一生看起來猶如蜉蝣一生那麼地短暫。雖然現在兩年的時間看起來漫長不已，但往後會介紹的種類中甚至有從孵化到羽化需要3年的種類呢！或許這些超長的幼生期會讓很多朋友對於牠們的飼育失去興趣，但有一點值得被提出來。那就是有很多的熱帶種一年四季都有成蟲在野外活動。這代表只要同時飼養著幾個不同代的幼蟲，便能夠一年四季都有成蟲玩賞。1990年代所飼養的白兜蟲四到八月份化蛹。但是經過十幾年來的馴化後，今天的白兜蟲一年四季都會化蛹。前蛹期大約20天、蛹期一個月。但週遭的溫度若低於20°C則前蛹期和蛹期都會加長。美西白兜蟲的蟄伏期大約是30天。開始活動以後成蟲可活2-3個月。雌蟲可產超過100粒卵。

白兜蟲的成蟲大部分都是灰白色，但也有少數米黃色的個體。翅鞘上的花

behind flour fermentation is that nutrients such as flour allow the microorganisms living in the substrate to grow exponentially. With more organisms, the decayed wood flakes break down faster.

From hatching to becoming L3, *D. granti* takes 120 days. However, if kept in improper substrate, it will take longer. It takes another 60 days to achieve maximum weight. From this point to pupation takes another 12-14 months. From egg to eclosion, *D. granti* takes two years. This makes *A. dichotoma*'s life cycle look short. Although two years seem long, some species of rhinoceros beetles take three or more years to complete their life cycle. However, one thing is worth pointing out. Adults of tropical species occur year round. This means if different generations are kept, the hobbyist would be able to enjoy seeing adult beetles all year. Back in the 90's, *D. granti* pupated between April and August. But after more than a decade of domestication, our *D. granti* now pupates year round. The pre-pupa period lasts about 20 days. The pupa period lasts about 30 days. If the rearing environment is below 20°C, both periods will extend. New adults stay inactive for about 30 days. Once active, adults live 2-3 months. Females can oviposit more than 100 eggs.

Most *D. granti* adults are grey, although a few are cream yellow. The spots on their elytra are ever changing; no two adults share the same pattern. Some have many spots; some are spotless; some have only a few spots; some have big spots; some have



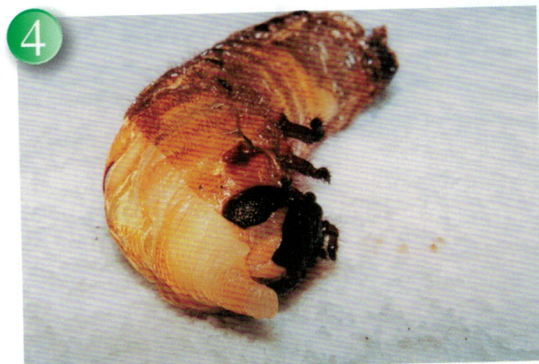
1 即將化蛹的美西白兜蟲前蛹。1998
Dynastes granti pre-pupa very close to pupation.



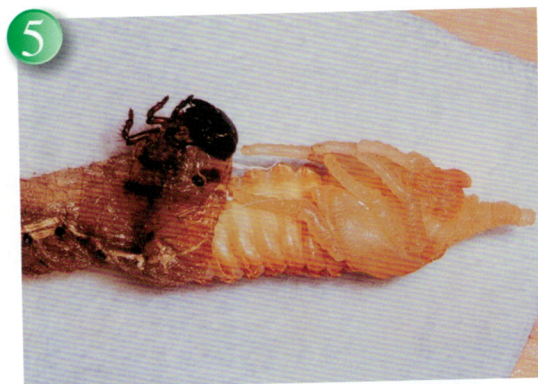
2 化蛹開始。白色的條狀物為氣管的表皮。
 Pupation has begun. The white stripes are tracheal skin.



3 頭殼裂開，可看見此時的犄角完全還沒開始膨脹。
 The head capsule splits into three. You can see that the horns at this moment have not been inflated yet.



4 犄角根部開始因血液充灌而膨脹。
 The base of the thoracic horn starts to inflate.



5 脫離舊皮。
 The entire pupa is now out of the larval skin.



6 前胸背板角膨脹了許多，背景為保麗龍杯做成的人工蛹室。
 The thoracic horn is now much inflated. The background is an artificial pupal cell made out of a Styrofoam cup.



7
↗雙角均完美的形成了!
Both horns are now completely formed!



10
↗努力地爬出蛹皮。
The adult working his way out of the pupal skin.



8
↗顏色加深為磚紅色。
The color of the pupa darkens to brick red.



11
↗完全脫出蛹皮，此時後翅仍然嬌小。
He is now completely out of the pupal skin. His hind wings are very small now and need to be spread.



9
↗化蛹一個月後羽化開始。
A month after pupation the adult is ready to eclose.



12
↗展完翅正在等其變硬中。
The wings have been spread. The adult is waiting for them to harden.

13



即將收翅。
The adult getting ready to fold his wings under the elytra.

16



1星期後可清楚地看見翅鞘上的斑點，但仍無任何白色出現。
A week later the spots on the elytra can be conspicuously seen. However, there is still no trace of white.

14



收完後翅。
The wings have been folded.

17



羽化數日後的雌蟲。52 mm。2003
Female few days after eclosion.

15



翅鞘變深褐色，並可隱隱約約地看見斑點。
The elytra become dark brown and if you look carefully, you can see spots on them.

18



羽化12天後翅鞘上的深褐色終於開始褪去。
12 days later the elytra start to lose the brown color.

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s waiting



紋千變萬化，完全找不到兩隻紋路相同的個體。有的有許多斑點、有的完全沒有斑點、有的只有少許的斑點、有的有很大或很小的斑點、有的斑點多到或是大到整個翅鞘都是咖啡色的。美西白兜蟲不難與美東白兜蟲區分。最主要的差別是美西白兜蟲的胸角比頭角還要長。顏色方面，大部分的美東白兜蟲都是黃色或是綠色，只有相當少數的個體是灰白色。

small spots; some have completely brown elytra. It's not difficult to tell *D. granti* and *D. tityus* apart. *D. granti*'s thoracic horn is longer than the cephalic horn. In terms of color, most *D. tityus* are yellow or green. Only a very few are grey.



↓羽化3個星期後白色終於出現。70mm
Three weeks later the thorax and elytra finally show white.



↗白兜蟲的翅鞘斑點千變萬化，絕不重複。1997
You cannot find two *Dynastes granti* individuals with the same spot pattern.



↗超巨大美西白兜蟲。84 mm。活體張錦洲提供。2008
Giantic *Dynastes granti*. Live specimen provided by Chang Jing-chou.

y brown el-
nti and *D.*
orn is lon-
s of color,
en. Only a



提供。2008
provided by



↑ 利奇氏長戟大兜蟲。135 mm。2003
Dynastes hercules lichyi.

長戟 (赫克力士) 大兜蟲

Dynastes hercules

不只在兜蟲亞科裡，也不只在金龜科中，也不只在鞘翅目內，就是在所有的百萬昆蟲種類中，長戟大兜蟲一直都是、也將永遠都是我的最愛。想法和我相同的人肯定不在少數。自從小學三年級第一次在日本童書上看見長戟大兜蟲後，我就立誓有一天一定要飼育長戟大兜蟲。結果一等就是12年。長戟大兜蟲的外形非常壯觀，就是連對昆蟲沒有興趣的人，看了都會再多看幾眼。尤其是那一根所謂「長戟」的前胸背板犄角，

Dynastes hercules is not just my favorite rhinoceros beetle. Of the one million insect species, the Hercules beetle has been and will always be my favorite insect. I am sure many people hold the same view. Ever since I saw a picture of it in a children's book when I was nine, I vowed to rear it one day. It took 12 years to realize that dream. *D. hercules* is truly special. Its horns are absolutely spectacular. Other than its cousin *Dynastes neptunus*, no other insect in the