頂三角兜蟲工程

Project Triceratops Beetle

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頂三角兜蟲*Phileurus truncatus*是金龜科兜蟲亞科的成員。這是一種大型、怪異、肉食性的金龜。牠幾乎遍佈整個北美：部分加拿大、墨西哥，以及整個美國。

The Triceratops Beetle ***Phileurus truncatus*** is a member of the family Scarabaeidae (Dung beetles, Chafers, Rutelines, etc.), subfamily Dynastinae (Rhinoceros beetles). This is a large, peculiar, carnivorous Scarab. The habitat of ***P. truncatus*** extends throughout much of North America: parts of Canada, Mexico and all of the US.

↗頂三角兜蟲。40 mm。2006。馬克馬尼格攝
Phileurus truncatus. Photo by McMonigle

目標：

1. 查出頂三角兜各個生活史階段的需求。
2. 把在人工環境產下的卵粒養成成蟲、讓人工飼育個體交配並產生有繁殖力之後代。終極目標是確認重覆極限 (在很多種類身上可以發現要讓野生母蟲產卵是非常容易的事，但是要讓人工飼育個體產受精卵卻是極度地困難)。
3. 分享飼育技術以及生活史。

Objectives:

1. To determine the requirements for all life stages of the Triceratops Beetle.
2. To rear larvae from captive laid eggs to adulthood, mate captive reared adults, and produce viable offspring. The purpose of this goal is to show repeatability. For many insects it can be easy to collect eggs from wild-caught females but far more difficult to collect viable eggs from captive reared animals.
3. To share culture and life cycle information with hobbyists and coleopterists.

話說從頭

這項工程於1994年開始。當時採到1隻野生成蟲和3隻一齡幼蟲。成蟲相當好動，並除了角形相當不同之外，長得頗像寬版的黑豔蟲。牠的全身猶如擦亮後的黑皮革，翅鞘有深深的縱向條紋。牠擁有和雌性鍬形蟲類似的大顎並且可以很輕易地在朽木上鑽洞。這隻看起來怪異又帥氣的新甲蟲看起來是最完美的飼育蟲選。要記錄牠的生活史肯定不難。畢竟，手上就已經有1隻成蟲和3隻幼蟲。但是當時的我毫無頭緒要在7年之後才能夠解開這隻蟲的生活史。

第一個問題是：「這是什麼甲蟲？」看牠的觸角牠應該是屬於花金龜科、鍬形蟲科、瘤條金龜科、或是黑豔蟲科。仔細看看以後，牠不論是成蟲或是幼蟲都沒有花金龜的特徵 (而往後也會發現牠們的幼蟲不會黏土繭)。幼蟲長得和一些金龜科的幼蟲類似，但是和任何金龜子幼蟲不一樣的是，當你捉拿牠時幼蟲會震動。這點非常地奇怪。

黑豔蟲和鍬形蟲的幼蟲會摩擦某些身體的部位來發出警告的聲音，但是這隻蟲絕對不是鍬形蟲因為鍬形蟲幼蟲的肛門為縱向的而且成蟲不長犄角。除此之外，鍬形蟲幼蟲經由摩擦所發出來的聲音很響亮，但是這隻蟲不會發聲。很明顯地，這隻也不是毛茸茸、個性兇猛又頭部巨大的瘤條金龜幼蟲。

The Beginning

The project began in 1994 with the collection of one adult and three L1 (first instar) larvae. The adult was very active and somewhat resembled a large, widened Bess beetle (***Odontotaenius disjunctus***, family Passalidae), but with much different and larger horns. Like Bess beetles, the entire body was polished black like patent leather, the elytra deeply striate and the pronotum possessed similar light sculpturing. The jaws, like those of Passalids and female Stags, were well developed and could be easily used to carve holes in rotten wood. This odd and handsome new beetle seemed like the perfect candidate for a rearing project. Documenting the life stages seemed an easy task; after all, larvae and an adult had already been acquired. There was no clue that this project would take seven years.

The first question was: "What beetle is this?" The adult antennae were lamellate which should put it in the Cetonidae (flower beetles), Scarabaeidae, Lucanidae (stag beetles), Trogidae (trox beetles), or Passalidae families. The adult and grubs had none of the traits of the Cetonidae (also, later on, it was noted that the larvae do not glue together earthen cocoons like Cetonids). Larvae resembled some Scarabaeidae larvae but, unlike any Scarab larvae, they quietly vibrated when held. This was very strange.

Passalidae and Lucanidae larvae stridulate--make noises or/and vibrations by rubbing together parts of their body. However, this was certainly not a Lucanid since stag larvae possess a vertical rather than horizontal anus and instead of the greatly enlarged mandibles of male stags, this adult beetle

雖然成蟲長得像黑豔蟲但是觸角卻又像金龜科。幼蟲的震動方式類似黑豔蟲但是六腳卻都很發達。黑豔蟲幼蟲看起來只有兩對腳因為最後一對已退化成發音器。

如果知道這隻蟲到底是金龜子還是黑豔蟲便可以幫助回答一些問題。黑豔蟲用純朽木飼育最好，但是金龜子幼蟲可能偏好腐葉、種子、朽木，或是其他食材。如果是黑豔蟲，幼蟲則要和成蟲養在一起因為成蟲會照顧幼蟲。如果手上的這隻成蟲是金龜科的成員，那幾乎可以確定牠是公的因為牠長有犄角並且肛門附近只有稀疏的毛。如果牠是黑豔蟲就公母的機率各一半。無論如何積極地尋找答案，這隻蟲的正確名稱一直到2年後才查出來。

找到這隻甲蟲和幼蟲的環境看起來已經接近尾聲了。它是一棵相當老舊的朽木。除了基部的1.8公尺以外，其餘早就倒塌，並且幾乎爛光。樹木內部已經被吃光掏空。朽木的正前方有一個大洞，內部的腐植土高出土表的部分大約只有15 cm，深入土表的部分不到30 cm。腐植土中含有枯葉及少許的朽木，大部分為老舊的昆蟲排遺、肢、頭，及翅膀。美東白兜蟲及各類甲蟲均會利用樹洞繁殖，但應該不會有甲蟲繼續利用這個即將消耗殆盡的場所。

had horns. Additionally, larval stridulation for Lucanids tends to be quite noisy while these larvae made no noise. It was obvious too, that the larvae were not the vicious, hairy, giant-headed carnivorous grubs of trox beetles.

Although the adult resembled adult Passalids the antennae were well defined into a more Scarab-like lamellate club. The larvae stridulation seemed similar to Passalids but all six legs of the grubs were well developed. Passalid larvae usually appear to have only four legs because the terminal pair is smaller and modified for making noises.

The answer to whether this beetle was a Scarab or a Passalid would have helped answer some questions. Passalid larvae are reared best on a rotten wood only diet but Scarab larvae might prefer to eat dead leaves, seeds, rotten wood, or a number of other things. If a Passalid, then it would be a good idea to keep the larvae and adult together because larval Passalids fare much better when kept with adults. Also, if the adult was a Scarab it would almost certainly be a male since it had well-developed horns and minimal setae at the rear of the abdomen. However, if this was a Passalid, the adult could be either sex since male and female Passalids have similar horn structures and setae. Despite numerous searches, the name question remained unanswered for over two years.

The habitat in which the beetle and grubs were found appeared to be at the end of its usefulness. It was an old rotten tree; all but the bottom six feet had broken off, fallen over, and mostly rotted away. The insides

將牠們帶回家之後的第一件事就是幫牠們佈置個家。既然成蟲和幼蟲都是在充滿腐植土的樹洞中發現的，飼養環境則模擬相同的環境：於20公升的魚缸中裝20 cm高的50%腐植土和50%朽木屑的混合。朽木屑內含有少量的枯葉，並使用前全部高溫處理過，以防蟎、蚯蚓、蜈蚣、螞蟻等。食材的溼度偏高，但不至於滴水。魚缸加蓋以防水氣的蒸發。最後成蟲和幼蟲都置入魚缸中。成蟲和幼蟲同缸有兩個原因。1.牠們是一起被發現的。2.黑豔蟲成蟲會和幼蟲溝通並照顧幼蟲。這隻蟲最接近黑豔蟲，而且幼蟲會彼此溝通。

起先一切安好。成蟲固定在黃昏的時候出土覓食提供的香蕉切片。幼蟲每2個星期挖出來檢查一次並且已經脫皮為二齡幼蟲。大約在2個半月的時候，進行例行性的檢查時，發現幼蟲全都不見了，只剩下3張皮。這些皮看起來並不像是幼蟲蛻下的皮，因為它們蠻厚的，並且側面有被剪開 (幼蟲蛻下的皮在中間有規則裂縫，並且薄如羽衣)。此外，幼蟲應該不是單純的死亡，否則屍體應該是充滿惡臭液體的一條屍袋，或是完全消失無蹤。

原來是成蟲終於吃膩了香蕉把幼蟲給吃了。肉食性昆蟲吃香蕉一點都不奇怪。步行蟲、虎甲蟲，以及螳螂都會吃香蕉，但是必須再額外補充動物性蛋

were hollowed out and most of the wood consumed years earlier. A big hole was broken into the front and the compost was now only about half a foot above ground level and barely two feet below. The substrate consisted of various composting dead leaves and some rotten wood, but mostly of old insect frass, legs, heads, and wings. ***Dynastes tityus***, ***Osmoderma eremicola***, and other species use tree holes as larval nurseries and would be very unlikely to lay a single egg in such an unprotected spot. The surrounding clay dirt had broken into the hollow at spots. Did the larvae have special protection against invading earthworms, wireworms, etc.?

After bringing them home, the next step was to set up a rearing container for the larvae. Since the adult and larvae had been found in a compost-filled tree cavity, a tree hole habitat cage was used. A mixture of half compost manure and half crushed-rotten wood was put into a five-gallon (20-liter) aquarium at a depth of six inches. The wood contained some dead leaves and was heat-treated to kill unwanted organisms including mites, earthworms, centipedes, and ants. The substrate was kept very moist but not dripping wet. A glass lid was placed on top to keep the moisture level constant. Finally, both the adult and larvae were placed in the cage. The adult was put in the cage with the grubs for two reasons. 1. They were found together. 2. Adult Bess beetles communicate with and attend to their larvae; this beetle seemed most like a Passalid and the larvae could communicate.

Everything seemed to be going well. Most days, the adult would come to the surface at dusk to feed on banana slices. The

↗三齡頂三角兜幼蟲。2006。馬克馬尼格攝
Third instar ***Phileurus truncatus***. Photo by McMonigle

白質。但是很奇怪的卻是這隻甲蟲竟然會吃肉。金龜子和黑豔蟲的成蟲是不吃肉的 (有些金龜子幼蟲吃肉，但是變為成蟲後是不吃肉的)。鍬形蟲的成蟲會吃肉，但這隻絕對不是鍬形蟲。原來，在野外，頂三角兜蟲護幼的方式就是把週遭的其他昆蟲給吃掉。這解釋了為什麼幼蟲之前活在暴露的環境中沒有被吃掉。但是在人工環境裡，由於沒有其他昆蟲可吃，頂三角兜的護幼行為竟然成了同類自殘的行為。

因為成蟲的性別仍然是個謎，這項飼育工程還未被宣告失敗。許多甲蟲的雌蟲可以在體內儲存精液高達好幾個月，所以每隔幾個星期便倒出腐植土檢查是否產卵。令人沮喪地，一直都沒有發現卵粒，4個月後宣告放棄。由於這是第一次採集到，甚至是耳聞，此種甲蟲，因此很擔心這是唯一一次繁殖此種的機會。這隻野生成蟲一直活到1997年，但是沒有產過一粒卵。

這隻蟲的身分變得更令人好奇了，

larvae were dug up and checked on every two weeks and had molted to second instar. At two and a half months the larvae were dug up for their biweekly inspection. Instead of digging up plump white grubs, one, and then two, and then three, "skins" were found. These did not appear to be molts because they were thick and cut jaggedly across the side. (Molting larvae produce a very thin shell--or molt--split perfectly down the upper middle of the back.) Also, the grubs could not have simply died since they would have been stinky black blobs or would have decomposed along with the skin.

The adult had finally gotten sick of the banana and eaten the larvae. A carnivorous insect feeding on banana is not at all strange. Obligatory carnivores such as ground beetles, tiger beetles, and many mantids will feed on banana but must still be provided with meat. What was incredibly strange was the fact that this beetle was carnivorous. None of the adult Scarabs or Passalids are supposed to be carnivorous (some Scarab larvae are carnivorous but the corresponding adults are not). Adult stag beetles are carnivores, but this was definitely not a stag. Apparently, in nature, adult Triceratops Beetles care for their larvae by eating any competition. This explains how the larvae had survived in an exposed tree hole. In captivity, with inadequate adult food, this type of 'care' turned into cannibalism.

Because the sex of the adult was a mystery, Project Triceratops still had a chance. Females of many beetles are able to hold viable sperm for months so eggs were searched for every few weeks. Sadly, no eggs were

因為牠竟然在都沒有冬眠的狀況下活了2年半。黑豔蟲成蟲通常活2-5年。但金龜子成蟲通常只能活幾個星期到幾個月。

二度挑戰

在1996年的冬天，一位朋友的哥哥鋸倒了一棵朽木後發現內部中空並且充滿了腐植土。在腐植土中，朋友發現了8隻巨型的幼蟲。收到幼蟲後很高興地發現這些是頂三角兜的幼蟲，因為牠們會震動！於是，頂三角兜工程又啟動了！這些是肥胖的三齡幼蟲，但體色仍然是白色的 (鍬形蟲科、黑豔蟲科、金龜科等幼蟲在造蛹室前體色會轉黃)。模擬樹洞環境的飼育箱再一次地被搭起。所有幼蟲養在一起。不同於成蟲，幼蟲沒有任何的互殘習性。此時1994年的成蟲仍然健在，但這一次當然沒有把牠和幼蟲飼養在一起。

同時間在1996年的年底頂三角兜的學名也終於曝光了。雖然***Phileurus truncatus***在北美幾乎都有分佈，但碰見牠的機會並不高。因為這個原因，美國所有的昆蟲圖鑑沒有一本提到此種，更遑論有照片或圖片。我從1994年開始便求助於許多昆蟲學家，但對於頂三角兜的身分卻總是無功而返。和當・阿爾哈第一次的對話中，幾句透過電話的形容就讓他辨認出這隻奇怪的甲蟲。當採集昆蟲

found and the search was given up after four months. Since this had been the first time to encounter (or even hear of) this beetle, it was feared that this had been the only chance for culturing of this odd creature. The wild-caught adult lived until early 1997 but never laid a single egg.

The identity of this beetle became even more curious because without a hibernation period, the adult still had lived two and a half years. Passalids generally live two to five years (not including the time spent in the egg, larva, and pupa stages). Scarabs, on the other hand, tend to live just a few weeks to a few months after reaching adulthood.

The Second Attempt

In the winter of 1996 a friend had found eight huge grubs in the compost-filled hollow of a rotten, dead, old tree that his brother had cut down. Upon receipt of the grubs it was happily obvious these were Triceratops Beetles. They vibrated! Project Triceratops Beetle was up and running again! These larvae were third instar and quite fat but still bright white (Lucanid, Passalid, Scarab, etc. larvae turn yellowish a month or so before pupal cell formation). Once again a tree hole habitat was set up for the larvae. The larvae were kept together. Unlike the adults, larvae showed no sign of cannibalism. The adult from 1994 was still alive but this time it was definitely not put in the same cage.

Also at the end of 1996, the scientific name for the Triceratops Beetle was finally discovered. Although ***Phileurus truncatus*** is found across most of North America and is not considered rare, it is seldom encountered. For this reason, none of the popular

已經有30年的歷史，並且在美國產甲蟲的辨認上無人能及。

幼蟲們滿足地吃著腐植土和朽木的混合食材、逐漸長大，並開始體色轉黃。在1997年的三月幼蟲們開始陸續製造蛹室，之間的時間差異只有幾天，蛹室跟蛹室之間的距離只有幾公分。幼蟲製造蛹室的方式為用身體和大顎推擠週遭的腐植土，和金龜子、黑豔蟲、鍬形蟲等製造蛹室的方式一樣。1個月之後幼蟲化蛹。再1個月後幼蟲們羽化為7隻成蟲 (1隻羽化失敗夭折)。新成蟲很健康。看起來這一次應該會成功地繁殖。7隻中一定會有雄蟲和雌蟲。繁殖用的產卵材和幼蟲的食材相同，深度20 cm，每個月採卵1-2次。就是不產卵。怎麼了?

1年之後成蟲開始逐漸死去 (應該是說體力不佳的被同伴吃掉)，到了1999年春天時只剩下1隻。我餵成蟲剛死亡的蟑螂，可是牠們還是很喜歡把開始老化的親兄弟姊妹分屍吃掉。雖然頂三角兜的生活史面紗已經開始被揭開，但是看樣子第二次的嘗試繁殖還是終告失敗。

再接再厲

幸運之神再一次地眷顧。幾個月後有位朋友詢問起有關飼養這隻怪蟲的經驗並告知他的野生成蟲順利地產下了

US insect identification books even mention this beetle, let alone provide a photo or drawing for identification. Since 1994 many entomologist friends had been asked for a possible identification with no luck. During the first conversation with Don Ahart, it took him only a short description over the phone to identify this odd beetle. Don has collected beetle specimens for thirty years and is unrivaled at US beetle identification.

The grubs were content to feed on the compost and rotten wood mix, grew larger, and began to turn a shade of yellow. In March of 1997 the larvae formed pupal cells within a few inches and within a few days of each other. The larvae formed pupal cells by compacting substrate with their mandibles and body, the same type of construction used by Scarabs, Passalids, Lucanids, etc. After a month the grubs molted into pupae. Another month and the pupae emerged as seven adults (one had died during the molt to adulthood). The young adults were very healthy and it seemed this time around would yield eggs and larvae. There had to be males and females with seven adults. A cage

頂三角兜蛹 • 45 mm • 2006 • 馬克馬尼格攝
Phileurus truncatus pupa. Photo by McMonigle

一些幼蟲，而他也願意送我一些幼蟲及一對野生成蟲。收到活體後成蟲和幼蟲分開飼養。8個星期之後檢查成蟲的飼養環境是否有卵時，竟發現1隻三齡幼蟲！由於使用的是有事先加熱處理過的介質，因此幼蟲肯定是頂三角兜。這是第一隻人工繁殖之幼蟲！這隻幼蟲的成長速度驚人。許多兜蟲需要4個月左右的時間才會轉三齡。此幼蟲從成蟲缸轉移到幼蟲缸和其他幼蟲一起居住。但不幸地，就只生了這麼一隻幼蟲。

幾個月後，所有人工繁殖的幼蟲都做了蛹室，包括了最小的那一隻。1個月後化蛹、2個月後變成蟲。最小的那一隻和大家同時間化蛹，但是體型只有人家的三分之二。這隻個體的發育比人家晚了好幾個月，但是卻被大家造蛹室的動作催促化蛹。在野外，不和大家一同化蛹、羽化的個體肯定會立刻成為新成蟲的食物。到目前為止，頂三角兜工程已經有了一些進展：人工幼蟲被成功地養到羽化成蟲、野生成蟲生了1隻幼蟲。

到了2000年夏末時，大部分的成蟲已把彼此吃掉，只剩下4隻。整個情況看起來好像又是死路一條。和大蒙確認以後得知他的人工成蟲也沒繁殖並且全數死去。最後我請他告知他當時讓野生成蟲繁殖的環境：一樣的容器、一樣比例的介質、一樣的深度、通通都一樣。

containing six inches of the same substrate used to successfully rear the larvae was set up and eggs were checked for once or twice a month. There were never any eggs. What was the problem?

After a year the adults began to slowly die off (actually the weak ones were eaten by the others) and there was only one left by the spring of 1999. The adults had been well fed with freshly dead giant roaches but still enjoyed ripping apart their brothers and sisters whenever their siblings began to get old and slow down. Although headway had been made in studying the rearing cycle it looked like, for the second time, the project was over for good.

Three Tries a Charm

Another stroke of luck! A few months later a friend asked about experiences rearing these strange beetles and mentioned that he had produced some larvae from wild-caught adults and would be willing to spare some captive produced larvae and an adult pair. Once again the larvae and adults were set up in separate rearing containers. After eight weeks the wild-caught adults' cage was checked for eggs and a third instar larva was found! Since the substrate had been heat-treated and the larva was definitely ***P. truncatus*** this was the first larva produced in the project! The larva had hatched and grown incredibly fast; most rhinoceros beetle larvae spend four or more months reaching L3. The grub was removed and placed with its older siblings. Sadly, this was the only larva produced.

A few months later, all of the captive reared larvae made pupal cells, including

一定是錯過了什麼。的確，他在最上層鋪了幾公分沒有事先加熱過又帶有蚯蚓的枯葉。

僅存的成蟲被轉移到40公升的魚缸，使用的介質沒有更換，只不過這一次在表面鋪了一層幾公分沒有加熱過的枯葉。1個月之後檢查是否有產卵，發現了2隻一齡幼蟲和10顆蛋，太好了！終於，頂三角兜工程的第二個目標達成了。再1個月後，又發現了16顆卵。十一月的時候成蟲食慾降低、停止產卵、接著開始冬眠。第二代幼蟲快速地成長並在2001年二月做蛹室。這批新成蟲一直到2001年夏末才產卵。

1994年從1992年老舊成蟲採到的卵，數量比1993年從新成蟲採到的還多，因為新成蟲幼蟲時期時吃的食物比較差。就目前所觀察的結果，一對成蟲或是一隻母蟲會看守幼蟲。但是，用裝有2隻雄蟲以及4隻或是以上的雌蟲的40公升飼育容器產卵量最高。每年產卵的高峰期為七月底至九月初。記錄中最晚的產卵期為1995年十一月六號。

結語

判讀幼蟲的性別似乎不可行，但是判讀成蟲的性別卻很容易。許多花金龜、兜蟲，以及其他甲蟲幼蟲可以用腹部是否有小刻點來判定性別。另外一個比較不可靠的方法是，許多種類的雄性幼蟲和雌性幼蟲體型上有差異；在老熟

the young one. After a month they molted to pupae and in another month to adults. The youngest grub pupated at the same time and emerged only 2/3 the size of his brothers and sisters. This larva was months behind but had been induced to pupate early by the pupal cell formation of the other larvae. It is certain that in the wild any larvae, which do not pupate along with others in the same tree hole, face instant death as a food source for freshly emerged adults. At this point the project had come pretty far. Captive reared larvae had been raised successfully to adulthood and one larva produced from wild caught adults, but no more larvae.

By late summer of 2000, most of the adults had eaten each other, only four were left. It seemed like this would become just another dead-end for project Triceratops Beetle. After a check with Damon it was learnt that he had also had no luck getting eggs from his captive raised adults and also that his had eventually all died. In a last ditch effort the exact conditions used for the wild adults was requested—exact size of cage, composition and percent of substrate, depth, everything. Something had to have been missed. There was. He had used a mixture of compost and wood but had also thrown a few inches of non-sterilized leaves on the surface that contained earthworms.

The remaining adults were moved to a ten-gallon aquarium along with the substrate they had been in the entire time, but with a few inches of leaves (non heat-treated) on top. The substrate was dug up after a month and two first instar larvae and ten eggs were

幼蟲上，這樣的差異很明顯。頂三角兜蟲幼蟲的性別無法判定，因為雄性幼蟲和雌性幼蟲體型相當，腹部也沒有可以用來判讀性別的刻點。判讀成蟲的性別是可行的：比對成蟲腹部的形狀及大小。

當你在閱讀此篇繁殖報告時，頂三角兜蟲工程的第三目標也已完成。飼育及觀察此蟲持續進行。有進行冬眠處理的成蟲活得較長久 (可將飼養容器放在室外或是冰箱)。過蛰伏後的成蟲目前最長壽的紀錄為38個月。平均壽命為12-24個月。較大型的個體可活24個月或是更久。

特別感謝大蒙・得彼、當・阿爾哈，以及凱莉・絲微福特。

found, eureka! Finally, the second goal of the project was completed. Another month later and 16 more ova were found. In November the adults reduced feeding, stopped laying eggs, and went into hibernation. The second-generation larvae grew quickly and formed pupal cells in late Feb. 2001. The adults would not lay eggs again until late summer of 2001.

In 94 more eggs were collected from a few females leftover from 92 than those laid in 93 because the newer generation wasn't reared as well. As far as we know the natural tendency is for one adult pair or one adult female to watch over grubs. However, I have had the best success getting high numbers of eggs from 10-gallons containing two males and four or more females. Each generation the egg laying took place primarily from late July to early Sept., seven eggs were laid as late as Nov. 6 (95').

Closing

Determining the gender of the larvae does not appear to be possible, however, determining the gender of adults is easy. Many Flower, Rhino, and other beetle larvae can be sexed using the presence or lack of tiny marking visible towards the rear of the abdomen. Though a less reliable method, the males or females of many species are differently sized and this difference can be readily seen in the size of full-grown larvae. The gender of ***P. truncatus*** grubs is indeterminate because the males and females are identical in size and there are no sexually dimorphic light or dark markings visible on the rear ventral segments. Adults, on the other hand, are possible to identify by comparing the shape and size of the rear abdominal sternite.

As you read this article the final goal of project Triceratops Beetle is complete. Rearing and observing this beetle continues. Adults given a hibernation period each year--cage placed in a cool basement or refrigerator during winter months--live longer. The longest lived adult (post maturity time only) was 38 months but the majority live 12-24. The larger and healthier animals live 24 or more.

Special thanks are extended to Damon Debee, Don Ahart, and Kelly Swift.

↘波特萊豎角兜的身體是亮面的。委內瑞拉產。104 mm。2007
G. porteri has a shiny exoskeleton. Venezuela

→豎角兜屬的幼蟲體毛很多。圖為波特萊豎角兜。2007
Golofa larvae are hairy. Pictured is *G. porteri*

→伊艾克斯豎角兜的身體是霧面的。祕魯產。70 mm。2006
Golofa eacus from Peru.

其他熱門兜蟲

Other Popular Rhinos

↘正在羽化的波特萊豎角兜。100 mm。2007
G. porteri eclosing.

↘波特萊豎角兜的蛹。2007
Pupa of *G. porteri*.

Golofa eacus和***G. porteri***是豎角兜屬裡頭比較常見的兩個種類。***G.eacus***比較小型，最大只有60 mm左右。***G. porteri***則可以超過100 mm。***Golofa eacus***和***G. porteri***的雌蟲可以產高達150粒卵。產卵介質腐植土或是發酵木屑都可以。卵期20-30天。幼蟲孵化後建議使用發酵木屑飼養。***Golofa***的幼蟲會在腐植物中四處亂鑽，經常在土表留下爬行後的痕跡。腐植物的深度必須在15-20 cm之間，否則幼蟲很容易因為無法製作蛹室而化蛹或是羽化失敗。大部分的***G. eacus***孵化6-10個月後化蛹，少數雄蟲會拖到18個月。***G. porteri***的雌蟲孵化6個月後開始化蛹，雄性幼蟲期12-18個月。***Golofa***的前蛹期約14天，蛹期30-40天。蟄伏期45-60天。開始活動後可活60天。此屬需要控溫，最佳溫度為19-22^{0}C。

和獨角仙同屬的***Allomyrina pfeifferi***體型相當袖珍，也經常會摩擦翅鞘和腹部，發出嘰嘰喳喳的聲音，非常可愛。由於是小型的兜蟲，生活史也就相對地縮短。此種卵期約14天、一齡幼蟲期約14天、二齡幼蟲期約28天、三齡幼蟲期約161天、前蛹期約15天、蛹期約40天。幼蟲可用腐植土或是發酵木屑飼養。雌蟲可產30-40粒卵。

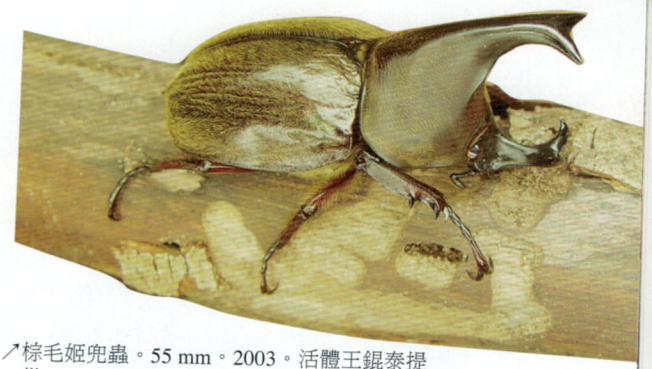
Golofa eacus and ***G. porteri*** can oviposit up to 150 eggs. Females will oviposit in both flake soil and fermented decayed wood flakes. Egg duration is 20-30 days. Larvae grow well on fermented decayed wood flakes. ***Golofa*** larvae burrow a lot in the substrate, often leaving tracks on the surface. Depth of substrate should be 15-20 cm, or larvae may not be able to make a pupal cell. Most ***G. eacus*** larvae pupate 6-10 months after hatching, with occasional males taking 18 months. ***G. porteri*** females begin pupation 6 months after hatching. Males take 12-18 months. Pre-pupa period for ***Golofa*** is about 14 days. Pupa period is 30-40 days. New adults stay inactive for 45-60 days. Once active, adults live about 60 days. The ideal temperature range for ***Golofa*** beetles is 19-22^{0}C.

Allomyrina pfeifferi is a mini rhinoceros beetle. They frequently rub their abdomen against elytra to make squeaky sounds. Because they are minute, they have a short life cycle. Egg duration is 14 days. L1 lasts about 14 days. L2 lasts about 28 days. L3 lasts about 161 days. The pre-pupa period is about 15 days. The pupa period is about 40 days. Larvae can be fed either flake soil or fermented decayed wood flakes. Females

↘雲頂兜蟲。33 mm。馬克馬尼格攝
Allomyrina pfeifferi. Photo by McMonigle

↘雲頂兜蟲蛹。馬克馬尼格攝
A. pfeifferi pupa. Photo by McMonigle

姬兜蟲廣泛分佈於整個東南亞。由於許多是海島型族群，因此姬兜蟲的亞種非常地多，至少有15個，另外還有5個獨立種。台灣較常見的有7種：最大型的「巨無霸姬兜蟲」***Xylotrupes gideon sumatraensis***、西馬的「黑金剛姬兜蟲」***X. g. beceri***和「龍牙姬兜蟲」***X. beckeri***、東馬的「婆羅洲龍牙姬兜蟲」***Xylotrupes beckeri intermedius***、綠島和蘭嶼的姬兜蟲***X. g. philippinensis***、腹部長滿絨毛的「佛羅倫斯姬兜蟲」***X. florensis***，以及來自於菲律賓的「棕毛姬兜蟲」***X. pubescens***。姬兜蟲的幼蟲期不長，一齡幼蟲期約21天、二齡幼蟲期約28天、三齡幼蟲期約7個月、前蛹期大約21天、蛹期大約28天、蟄伏期30-45天。成蟲相當長壽，過蟄伏以後可活6個月以上。姬兜蟲的戰鬥慾望非常強盛，有些東南亞國家會拿牠們來進行鬥蟲活動。

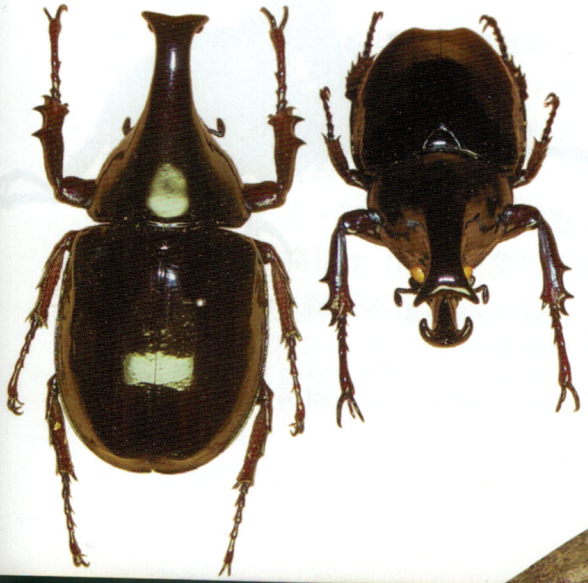


↗棕毛姬兜蟲。55 mm。2003。活體王錕泰提供

X. pubescens. Live specimen provided by Wang Kun-tai

↑↓婆羅洲龍牙姬兜蟲。60 mm。2001

X. beckeri intermedius.



lay 30-40 eggs.

Xylotrupes gideon can be found throughout Southeast Asia. Because many populations exist on islands, ***X. gideon*** contains at least 15 subspecies. There are 5 additional species in this genus. 7 varieties are commonly kept in captivity: ***X. g. sumatraensis*** from Sumatra, ***X. g. beceri*** and ***X. beckeri*** from West Malaysia, ***X. beckeri intermedius*** from Borneo, ***X. g. philippinensis***, ***X. florensis***, and ***X. pubescens*** from Philippines. They don't have a long life cycle. L1 lasts about 21 days. L2 lasts about 28 days. L3 lasts about 7 months. The pre-pupa period is about 21 days. The pupa period is about 28 days. New adults stay inactive for 30-45 days. Once active, adults can live

↘巨無霸姬兜蟲可超過80 mm。2005

X. g. sumatraensis can exceed 8 cm.

↑黑金剛姬兜蟲。68 mm。2000
X. g. beceri.

↗佛羅倫斯姬兜蟲。60 mm。1999
X. florensis.

↗蘭嶼姬兜蟲的蛹。50 mm。2006
Pupae of ***X. g. philippinensis*** from Taiwan's Orchid Island.

↗蘭嶼姬兜蟲。47 mm。2003。標本王錕泰提供
X. g. philippinensis from Taiwan's Orchid Island. Dried specimen provided by Wang Kun-tai

↗龍牙姬兜蟲。53 mm。2008。標本蟲磨坊提供
X. beckeri. Dried specimen provided by Insect Mall

↗龍牙姬兜蟲的頭角開叉特別大。53 mm。2008。標本蟲磨坊提供
Cephalic horn of ***X. beckeri*** is heavily forked. Dried specimen provided by Insect Mall