Unusual Scarabs

by the Readers

Some Unusual Scarabs from the Collections of the Natural History Museum, London

by Conrad P.D.T. Gillett

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The superfamily Scarabaeoidea can happily count among its hordes of members many unusual and striking species. These vary from those possessing truly bizarre armature to those clad in the most sumptuous of liveries, or from those which have attained gigantic proportions to those whose life histories are unusually specialized and peculiar. However, sometimes one may find not only an extraordinary species, but also an unexpected and curious specimen which is atypical in some way. These specimens may be naturally abnormal through a freak of development or genetics, but in some cases the abnormality may be entirely man-made.

I present here just a few photographs of such remarkable specimens housed in the drawers of the Natural History Museum in South Kensington.

The male Goliath beetle (Goliathus goliatus Linneaus, 1771) (Cetoniinae: Goliathini) illustrated in Figure 3 is not remarkable for any natural reason (although it does represent the attractive variation conspersus Kraatz), but rather, if one takes a closer look at the pronotum and both elytrae, there are clues as to exactly how this fine specimen came to be

Figures 1 and 2 depict a male Megaceras jason (Fabricius, 1775) (Dynastiane: Oryctini) whose pronotum has developed asymmetrically. The length of the beetle and the shape and size of its cephalic horn would indicate that it is a major male. The strongly-developed, forwardly-directed protuberance on the right side of the pronotum would also confirm this. However, on the left side of the pronotum the beetle has been left wanting as the projection is only about half the size of that on the right. The specimen thus displays features of both a major male and that of a less-developed individual. It is interesting to note that only the projecting part of the pronotum has been affected, the rest is apparently entirely normal.

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Asymmetrically developed male of *Megaceras jason*.

Figure 1: Dorsal view.

Figure 2: Lateral view.

Figure 3: *Goliathus goliatus* very probably brought down by enemy anti-aircraft artillery. captured! The obvious puncture marks and cracks breaching its armour are, I believe, tell-tale signs that the last thing this particular beast saw was the wrong end of a Victorian big game hunter’s blunderbuss! The requisite imagery of the safari-suited, pith helmet-clad and monocled collector (who undoubtedly also sported a fine moustache!) may not be entirely inaccurate as there are documented records of the first collectors of these giant beetles having to resort to the use of firearms to bring down the insects, which at that time were considered great rarities (Lachaume, 1983). It may be possible in the future to X-ray the specimen to confirm whether evidence of lead shot is still present inside the beetle.
At first glance one would be forgiven for identifying the specimen shown in Figure 4 as a male *Megasoma actaeon* (Linnaeus, 1758) (Dynastinae: Dynastini). If this was the case, I hate to disappoint, because in fact, although the species would have been correctly named, the specimen is only half male! The forebody (head, pronotum and anterior legs) does indeed belong to a large male *M. actaeon*, but the posterior (elytra, abdomen and middle and hind pair of legs) is most definitely female, as can be confirmed by the roughened surface of the elytra – a feature not present on the males of this species. Also of interest is the fact that whoever undertook this particular repair obviously had little appreciation of the correct proportions these body parts should have. Comparison of this specimen to a photograph of a 'complete' male and female

**Figure 4:** *Megasoma actaeon* 'hermaphrodite'.

![Megasoma actaeon 'hermaphrodite'](image)

**Figure 5:** Male (left) and female (right) *Megasoma actaeon*. Courtesy of Team Scarab, University of Nebraska State Museum, Generic Guide to New World Scarab Beetles (URL: [http://www-museum.unl.edu/research/entomology/Guide/Guide-introduction/Guideintro.html](http://www-museum.unl.edu/research/entomology/Guide/Guide-introduction/Guideintro.html)).
M. actaeon should suffice to illustrate this last point (Figure 5.). Such composite specimens, sometimes referred to as ‘chimeras’ are not uncommon in large old collections. They are most probably created accidentally and ignorantly to fix breakages, although it has not been entirely unknown for such specimens to have been constructed intentionally for more sinister reasons, including the deception of other entomologists through the ‘creation’ of new species. The most famous case of this subterfuge is probably that of Aphodiatus arvernicus Hoffmann, 1928, a species which, following its description based on specimens purportedly from the French Massif Central, has never been re-found. It remained an enigmatic element of the French fauna until recently, when it was conclusively shown to be a chimera constructed from two commoner species (Calmont & Faure, 2004).

My last photograph again represents a chimera, only in this case, one that was misinterpreted and consequently described as a new species. The specimen in question is the holotype of Phanaeus costatus Olsoufieff, 1924, although in fact there is nothing ‘Phanaeus’ about it! The forebody is that of a male Coprophanaeus jasius (Olivier, 1789) (although I suspect it may actually be that of C. cyanescens Olsoufieff) and the abdomen and elytra that of a Diabrotica mimas (Linnaeus, 1767). To be fair to Olsoufieff, he also saw these similarities, although he did not detect that the specimen was a composite of these two species. It was not until 1982 that the synonymy was published by Patrick Arnaud (Arnaud, 1982). No further specimens of C. costatus have ever been collected, although the author urges other enthusiasts to search in the most likely habitat – drawers of historical insect collections!

Figure 6: Holotype of Phanaeus costatus Olsoufieff, 1924.
Closing note: In the Paris museum there is a magnificent little series of a most beautiful undescribed phanaeine, whose blue forebody (eerily similar to *Coprophanaeus saphirinus*) contrasts with the metallic green and copper hind parts (which closely approximates that of *Sulcophanaeus leander*)!!!

Acknowledgements

Thanks to James Kitson (University of East Anglia) for photographing the BMNH specimens and thanks to Brett Ratcliffe (University of Nebraska) for permission to use photographs of *Megasoma actaeon*.

References


A Most Curious Beetle from the Insect Collection of William Hunter (1718-1783)

by E. Geoffrey Hancock

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These three photos are from an article of *The Linnean*. The full issue can be downloaded at: [http://www.linnean.org/fileadmin/images/Linnean/Linnean_24-3_july_2008.pdf](http://www.linnean.org/fileadmin/images/Linnean/Linnean_24-3_july_2008.pdf).

Figure 1: ‘*Scarabaeus neptunus*’ the curious fake beetle in Hunter’s collection. The abdomen, middle and hind legs are from *Dynastes hercules*, the main thorax and front legs from *Megasoma actaeon*, and the smaller thorax with head are a *Strategus* species as are the front ‘tarsi’.
Editors Note: We were so happy with the contributions, we decided to send each contributor this second, 8 X 10 print of our curator Cindy. Thank you to all who sent us an article about unusual scarabs.
The Strange Genus *Lethrus*

By Olivier Décobert

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*Lethrus* is a genus of scarabs belonging to the family Geotrupidae. They build underground passages to lay their eggs and carry in fresh leaves which provide food for the larvae.

These specimens are *Lethrus tuberculifrons* (Ballion, 1870) from Kazakhstan that I obtained by exchanging with a Czech entomologist but other species of this genus have a similar morphology and behavior. They can be found in eastern Europa and Asia. The male is very special because of two teeth on the mandibles which look like fangs. The insect could also be compared to a walrus!

Darwin wrote, in *Descent of Man* (1871), about secondary sexual characters of insects: “In *Lethrus*, a beetle belonging to the great division of the lamellicorns, the males are known to fight, but are not provided with horns, though their mandibles are much larger than those of the female.”

So, like horns for other scarabs species, males can use this curious tool as a weapon to fight with other males. After that, the couples work jointly for nidification. It is easy to see that mandibles are a good adaptation to cut leaves because of their scissor-like form.
Darwin also wrote: “The two sexes of *Lethrus* inhabit the same burrow; and the male has larger mandibles than the female. If, during the breeding-season, a strange male attempts to enter the burrow, he is attacked; the female does not remain passive, but closes the mouth of the burrow, and encourages her mate by continually pushing him on from behind; and the battle lasts until the aggressor is killed or runs away.”

In June 2000, I visited The Natural History Museum of London. There was a large photograph of Charles Darwin (1809-1882), with a box of beetles which was his first collection. It was written that “Darwin’s boyhood fascination for beetles kindled his interest in natural history.”

Later, Darwin used observations of scarabs (*Lethrus* and many others) in his theory of natural selection.

In 1977, a team of scientists studied the behavior of *Lethrus*: “The complex orientational and nest behavior of *Lethrus* is not accompanied by enlargement of the brain and its presumed associative centres, the mushroom bodies. Among several scarabaeid beetles of comparable size (*Amphimallon solstitialis*, *Geotrupes stercorosus*), *Lethrus apterus* gains the first place in behavioral complexity but the last in number of sensilla on the antennal club, number of ommatidia, and the volume of mushroom globuli.”
Bibliography:


"I want to give a big Thank You to all the scarabaeologists who contributed stories and photographs of unusual scarabs. All of the employees have been trying to persuade the editors to hold a photo festival where scarabaeologists send in photos of themselves. So far, our pleas have been ignored!

Thanks again for your participation."

Love,

Cindy
A much younger Barney checking for *Uroxys gorgon*. The specimen pictured below was collected off this same sloth.

**Uroxys gorgon Arrow, 1933**

by Barney D. Streit

Although the unusual lifestyle of *Uroxys gorgon* has been well documented in the literature, it is worth mentioning again here.

Adults can generally be collected by three methods: at light, in dung traps, and on the bodies of sloths. As noted by Brett Ratcliffe, “It is generally suspected that these beetles are phoretic coprophages dwelling on the sloth until such time as it defecates. The scarabs can then abandon their host and feed on the freshly deposited dung.”

Data for the three specimens pictured are:

Left: PANAMA: Panama, Cerro Campana, 860 M elevation, 9.9 road km N. Interamerican Highway, 1-1-1994, Taken in pitfall trap baited with human dung.

Middle: PANAMA: Panama, Cerro Azul, 700 M elevation, 17-XII-1993, Taken on Fur of Left Shoulder of Three-Toed Sloth *Bradypus variegatus*.

Right: PANAMA: Panama, Cerro Azul, 700 M elevation, 17-XII-1993, taken at BL/MV Lamps.

Reference:

A Most Unusual Scarab.

Unusual (en / yoo / zh / ooel): unlike what is expected, differing in some way from the norm. Weird.

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He strolled out of the alley trying not to look like an alien who had just buried his spaceship under the forsythia bushes.

---- Ted Reynolds, “Border Incident”

Actually, my scarab vying for the honor of most unusual was probably not that unusual in terms of magnificent horns or strange body form, but how it behaved WAS unusual. The guts of what follows is liberally taken from a small paper I wrote in 1990 and published in the Boletim Museu Paraense Emilio Goeldi, Series Zoologia 6:109-113. Given the age and rarity of that tome, the information is repeated here, in part, for your scarabophilic pleasure.

_Cnemida retusa_ (Fabr.) (Figure 1) is a small (9-12 mm) ruteline scarab found in the northern half of South America (genus revised by Jameson 1996). It is a diurnal foliage feeder as are the other seven species in the genus. I have observed and collected _C. aterrima_ Bates in Mexico and _C. intermedia_ Bates in Panama and have observed both species resting normally on their substrate (i.e., all six feet planted on the dorsal or ventral surface of a leaf of their food plant).

While on a collecting trip 275 km south of Manaus, Amazonas, Brazil many solar cycles ago, I observed adults of _C. retusa_ and was immediately intrigued by the orientation of seven beetles resting on the dorsal surface of leaves in an area of approximately nine square meters. The shrubs on which the beetles rested were in full sun (no forest canopy) and about 1.5 meters high. Two

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Figure 1. Habitus of _Cnemida retusa_ (Fabr.).
specimens perched “normally,” but the other five were each resting completely on their sides (Figure 2)! What the frak?! Dead? Uh uh. Intoxicated? Nyet. Sun tanning? Au contraire.

Although many insects position themselves in certain positions on leaves or branches, this was the only instance known to me in which an insect postures itself completely on the side of its body while resting on a horizontal, upper surface. I believe, moreover, that because these scarabs are so dorsoventrally flattened, such a resting position is difficult to achieve and maintain. Why such an unusual and unique resting attitude? That is the compelling question.

Other Scarabaeidae, most notably small dung beetles, have been observed to perch on leaves for several reasons: as a strategy for detecting airborne, dung odor trails (Howden and Nealis 1978); assessing predator density at food sites (Young 1982); mimicking distasteful and aposematically colored species (Poulson 1980); or thermoregulating (Young 1984). *Cnemida retusa* seemed to be doing none of these things.

I believe these scarabs were utilizing a simple, but sophisticated, behavior to escape predation. Resting on the side of the body created a distinct asymmetrical image that possibly resembled certain bird droppings or detritus, or, at least, did not appear to be an insect prey item by virtue of asymmetry. This would be clearly beneficial to a dark beetle resting on a relatively light-colored green leaf. It should be noted that feeding did not occur while in this position. You try eating from a dinner plate beneath your head while laying on your side with your arms firmly at your sides!

There is an obvious connection between cryptis and vision. Environmental parameters, as well as the number and kinds of predators, affect a prey’s “apparency” to a predator. Predator avoidance by cryptis is usually aimed at a generalized predator. The predators of *C. retusa* remain unknown but, considering that camouflage is optical deception, then only animals with a highly developed eye (vertebrates) should be considered as potential predators. Animals that hunt by a sense of touch (spiders) or smell (mammals) are not the predators in this case (Portmann 1959). The most likely predators of *C. retusa*...
are foliage-gleaning birds. Rather than dissolving its body outline into its background by crypsis as is typical for many other animals, *C. retusa* instead mimics something that is not sought after by a bird predator, namely, fecal droppings.

It is well-known that many animals possess colors and patterns that are cryptic in nature. Crypsis is generally considered to have two primary functions. In aggressive crypsis, the color, pattern, and form of an animal's body enable it to better approach potential prey. This is accomplished by concealing patterns that permit the would-be predator to blend with the background. Examples of this are tigers in grasslands, polar bears in ice fields, and the many different reptiles inhabiting deserts or the forest floor.

Seemingly more prevalent is mimetic resemblance to escape predation. Examples of this are a fawn in sun-dappled forest, counter-shading in many aquatic animals, and the similarity to leaves and twigs in many insects. Although protection is never absolute, numerous experiments have shown the positive selection effect of color adaptations whether it is by mimicry or camouflage.

Pattern disruption is one form of camouflage whereby an animal's bilateral symmetry (whether in body form, color, or markings) is altered. This is usually accomplished with concealing patterns (as with certain moths on tree bark) but may also take the form of bright, contrasting colors and bold, leading lines (many butterflies and long horn beetles). The “apparency”, or probability of being discovered, is reduced by such pre-discovery defenses.

The development of cryptic patterns is usually accompanied by other changes as well, such as in behavior (Wickler 1968). Stick insects, for example, will sway or quiver in a gentle breeze to behaviorally mimic twigs or branches upon which they are resting, and butterflies and moths when at rest reduce their own tell-tale shadow by body orientation. Resemblance to the substrate or another object is, obviously, enhanced by appropriate behavior in combination with color and pattern.

The unique behavior observed for *C. retusa* adds an additional component to our inventory of adaptations to escape predation and qualifies this beetle for a designation of most unusual. As J. B. S. Haldane quipped, “The universe is not only queerer than we suppose but queerer than we can suppose.”

REFERENCES


The Dynastinae of Mexico, Guatemala, and Belize

The web pages for the NSF-funded project on the Dynastinae of Mexico, Guatemala, and Belize are now available at: [http://www-museum.unl.edu/research/entomology/Mexico-Survey/home.html](http://www-museum.unl.edu/research/entomology/Mexico-Survey/home.html)

The pages are still under development and will be continually updated. The project is in year 2 of a 4 year funded effort. For example, we now have about 16,000 records in the database but anticipate that we may reach 60,000 records. One of the final products will be a highly illustrated, book-length monograph on the dynastines occurring in this study area. This volume will complete the coverage of Mesoamerica and complements the first two volumes: *The Dynastinae of Costa Rica and Panama* (2003) [http://www-museum.unl.edu/research/entomology/dynintro.htm](http://www-museum.unl.edu/research/entomology/dynintro.htm) and the *Dynastinae of Honduras, Nicaragua, and El Salvador* (2006) [http://www-museum.unl.edu/research/entomology/Honduras-book.htm](http://www-museum.unl.edu/research/entomology/Honduras-book.htm).

We would welcome data that anyone would care to share for inclusion in the research.

Sincerely,

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and

Ron Cave
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The last few trips had gone well with no real problems. This seemed to change when accompanied by Bruce Gill, a Ph.D. student at that time and, then and now, a friend and co-worker on many projects. Bruce and I were invited to collect with Gary Manley, who lived in Guayaquil, Ecuador. Coastal Ecuador north to Manta was an area of interest as it had some unique vegetation, was usually dry, but had recent rains according to Gary. We left Ottawa on February 17 at 6:45 PM to fly to Montreal and from there to catch the 8:55 flight to New York, which didn't actually leave until 9:40 PM. We arrived at La Guardia forty minutes late, leaving us little time to get to Kennedy Airport for the midnight flight to Ecuador. At La Guardia the “Gill factor” came into play - Air Canada had lost his suitcase! Nearly an hour was spent filling out forms, then a hasty taxi ride to Kennedy Airport, arriving at 11:45 PM. We were lucky and left at 00:05 AM for Miami, then on to Guayaquil, arriving at 8 AM. We were met by Gary and his wife, Elinar, and taken to their home.

In the late afternoon, after errands, we went to a suburb of Guayaquil called Los Ceibos (Photo 1). The land there was in the early stages of development. Some big trees were down and several roads had been bulldozed through the scrub. At the time there was no construction activity, so we were free to bash bushes, pull bark and set out traps. There was enough rain to make conditions perfect for scarabs, cerambycids and even the ubiquitous weevils. During our two weeks in Ecuador we visited Los Ceibos several times, collected a rare Phanaeus, several aphodines, canthonines, and at light collected Phyllophaga, Anomala and a variety of cerambycids, weevils and many other Coleoptera. Unfortunately, it is by now just part of the city.

On our second day with Gary, we drove south near the coast almost to the Peruvian border. Standard Fruit, the company that Gary worked for at the time, had a plantation at Machala, and we spent the afternoon collecting...
in some nearby thorn scrub. The results: one anomaline on the flower of a composite, *Pandeleteius* (for the uniformed - the genus of weevils that my wife, Anne, works on) and numerous cerambycids. That night our black light set in the same area yielded only a few ataenines (or whatever one calls them these days) and some click beetles. After a night in the company guest house, we drove first to a cut over area south of Naranjal and beat clumps of dead leaves along the forest edge, collecting two species of scarabs and numbers of cerambycids and weevils. The afternoon was spent in a small, wet forest ravine 22 km south of El Triunfo. There we collected two species of *Rutela*, one *Pelidnota* and the usual mixture of other beetles. As we were getting ready to leave it started to rain and on our way to the car we saw a red, yellow and black ringed snake. We were not sure if it was a coral snake or a mimic, so took pictures (Photo 2) and, despite our protests, Bruce collected it. That night it rained hard!

For the next two days we collected near Guayaquil. The morning of the first day we were stopped by the police and asked for the new registration. It wasn’t in the company car, we so spent the morning looking for it, finally finding that a person in the Standard Fruit office had it! The afternoon was spent setting traps and the next day picking them up, along with those set at Los Ceibos. The next day the three of us drove to Tinalandia, a resort with a golf course, 15 km east of Santo Domingo de los Colorados. It was a great place to collect; the neatly kept golf course (Photo 3) was edged with easily accessible...
forest, handy for traps or beating. The first day Bruce and I saw some push-ups in the fairway, and since no one was playing golf at the time, we investigated, excavating some burrows to a depth of approximately four feet (Photo 4). We were delighted to find a male *Athyreus championi* Bates. During that day and the next we dug a total of 18 burrows yielding 14 specimens of the *Athyreus*. The ground keepers, at times, watched us from a distance, but said nothing as we were careful to replace our divots! Later Bruce and I contemplated writing a note called “18 holes in an Ecuadorian golf course”, but other projects seemed more important. Meanwhile, Gary found a dead stump about ten feet high at the forest edge and while pulling it apart, collected a series of the odd genus *Cryptogenius* under the bark, the catch of the day! During our three-day stay at Tinalandia we had good collecting beating, in our traps and at light. We then left to drive along the coast north to Manta.

Our drive to Manta was slowed by three hours on dirt roads and some rain. It was an interesting drive, with patches of scrub forest with large cacti. It was hot when we arrived at Manta about 4 PM, but there was a good breeze off the ocean. At a three-story beach hotel we had two choices: a third story room with a breeze or an air conditioned room. Being naturally parsimonious we took the less expensive room with the breeze. We then collected on a nearby patch of scrub until dusk, then we set our black light on the roof of the hotel where it overlooked the scrub and went to eat. It was after dinner that we found out that we had made a serious mistake! The sea breeze had left us and the night had become still, very hot and humid. There were lots of insects flying, of which 90% were mosquitoes. Since our room was on the top floor under a flat roof, we either cooked or left the door and window (no screen) open for air and had our blood volume lowered by swarms of hungry mosquitoes. The one cheerful aspect of the evening was that our light, three stories above the scrub, attracted a surprising number of beetles, including several species of aphodiines, *Trox, Leucothyreus* and three *Bolbapium baeri* Boucomont, plus an assortment of weevils and carabids. That so many beetles were flying that far from the ground was interesting; we just wished the dipteran pests were limited to ground level! Although not spending five dollars on air conditioning was, as the saying
goes, penny wise and pound foolish, the amount of chitin at our light on the roof made up for our discomfort.

The next morning we were up by 6:30, collected for an hour near Manta, then drove south to the coastal town of Puerto Cayo. About 1.5 km east of the town there was some very good diverse thorn scrub (Photo 5) which, over several hours of beating, yielded numerous weevils and cerambycids. We stopped collecting in mid afternoon because of the heat and drove back to Guayaquil; the evening was spent taking care of specimens and scratching bites.

After a day spent collecting at Los Ceibos, the following day we drove on the Cuenca road to 9,100 feet, 3 miles east of Zhud. General collecting halted when I found several interesting looking burrows. After only a few inches of digging I found two large dynastid larvae near but not in the burrow. They didn’t seem to have any supply of food, so I continued digging and near the end of the burrow found an adult Heterogomphus dilaticollis Burmeister with some fresh grass cuttings. At the time I thought it was odd to find larvae near the burrow, but any further digging was thwarted by a group of very drunk locals. It was carnival time and they had obviously had enough to be antagonistic toward anyone digging holes in their land. We left rather quickly.

On a different occasion I had noted burrows on the lawn of a hotel in Quito, and found a dead H. dilaticollis near one of the burrows. Only after other findings did I begin to suspect that adults may be provisioning the larvae with grass cuttings or similar vegetation. I have no direct proof but suspect that several genera of dynastines may furnish some food to their larvae.

That day at Zhud was the final day of collecting for that trip. We went to the airport the next day, checking in at noon. The “Bruce factor” then started again. We sat in the airport until 5 PM and at that time they reissued our tickets to fly us to Miami. After clearing customs in Miami, we changed to Pan Am, reaching New York at 1 AM. Overnighting at the airport hotel, we then flew to Montreal, finally arriving at Ottawa at 4 PM. The nice part was that there was no snow, but it was about -20° C!
Chromatic Variation in Geotrupidae
by Olivier Décobert
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More than 30 years ago, the first geotrupids I found were black or sometimes with a little blue shine. I thought that these scarabs were always dark but later, by traveling, reading entomological literature and exchanging beetles with other entomologists, I quickly learned that there is great chromatic variability in this group of scarabs.

In Europa, the most spectacular examples of that diversity are in the genus *Trypocopris*:

![Trypocopris vernalis (Linné)](image1)

![T. fulgidus (Motschulsky)](image2)

![Trypocopris pyrenaeus (Charpentier) – various forms](image3)

Some authors think that *T. fulgidus* of Turkey is in fact a subspecies of *T. vernalis*. 

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The Asian *Phelotrupes* (*Chromogeotrupes*) *auratus* (Motschulsky) is also very variable. To finish with Europa, *Geotrupes mutator* (Marsham) is often greenish. Its close cousin *Geotrupes stercorarius* (Linné), which was the first big geotrupid I collected, is habitually dark black, but I know entomologists who have found colored specimens of this species.

*Anoplotrupes stercorosus* (Scriba) is very common in the forest of Raismes, near my home. This species is often black but sometimes with a blue shining. It is often found in dung but also on rotting mushrooms.

We can conclude that geotrupids can have the same chromatic potential that other groups of scarabs like Cetoniinae or Rutelinae, to give well-known examples. As I wrote in *Scarabs #35* (January, 2009, pp. 8-9) about European *Protaetia*, it is the microstructure of the cuticle which selects the colored radiation which reflects off the insect by light interference and gives its appearance. It is a structural color, not pigmentary.

This phenomenon is widespread in nature, not only with insects, but also birds, fishes, etc... and is always a source of astonishment for our eyes. Can you imagine that these marvelous geotrupids are found in... dung?