

# The Book of Beetles

A Life-Size Guide to  
Six Hundred of Nature's Gems

Edited by Patrice Bouchard

With 350,000 known species, and scientific estimates that millions more have yet to be identified, beetles are one of the most remarkable and varied creatures on earth. They range from the delightful summer firefly to the one-hundred-gram Goliath beetle. Beetles offer a dazzling array of shapes, sizes, and colors that entice scientists and collectors across the globe.

This collection covers six hundred significant beetle species. Each features a distribution map, basic biology, conservation status, and information on cultural and economic significance. Full-color photos show the beetles both at actual size and enlarged to show details. Based in the most up-to-date science and accessibly written, the descriptive text will appeal to researchers and armchair coleopterists alike.

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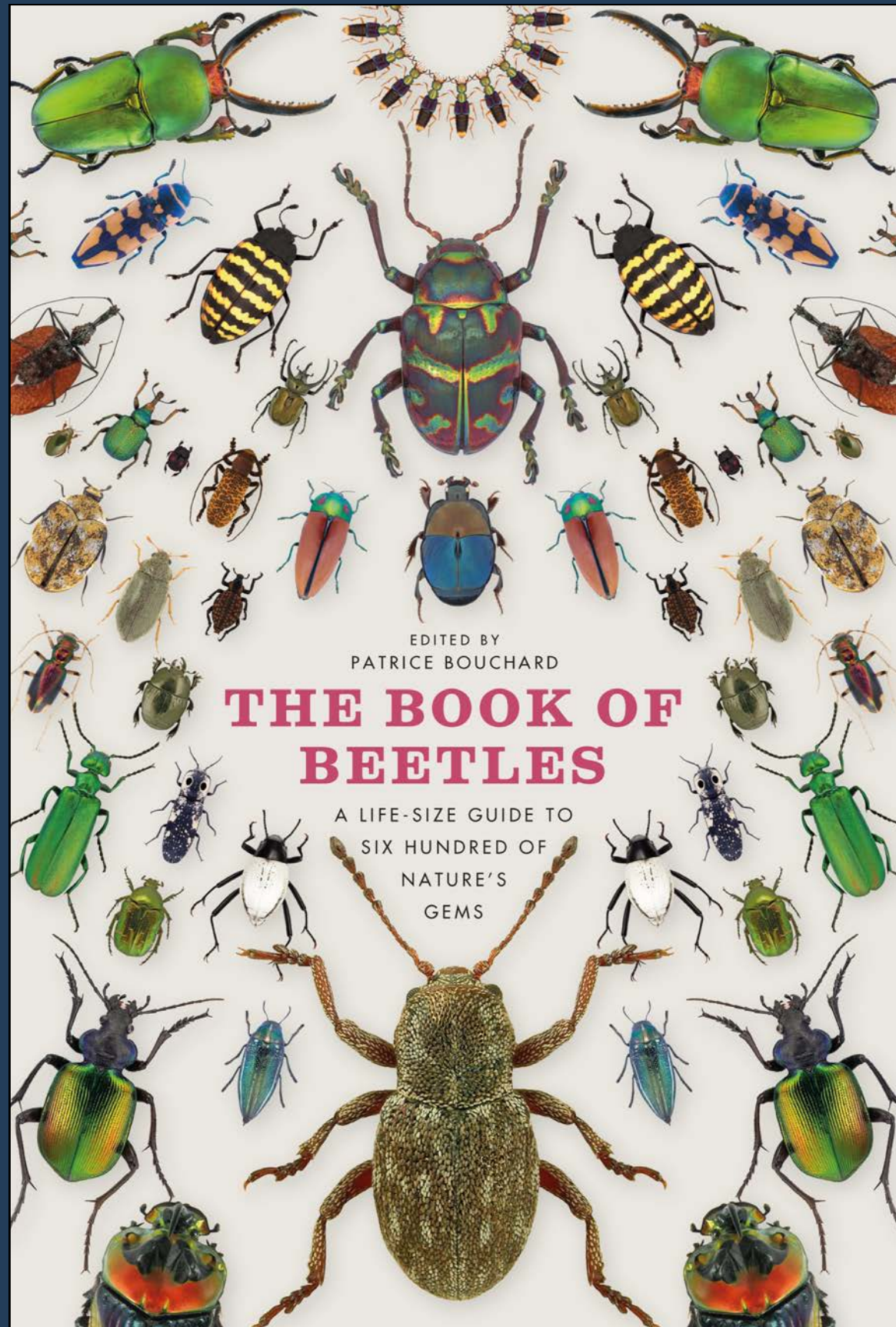
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EDITOR

PATRICE BOUCHARD

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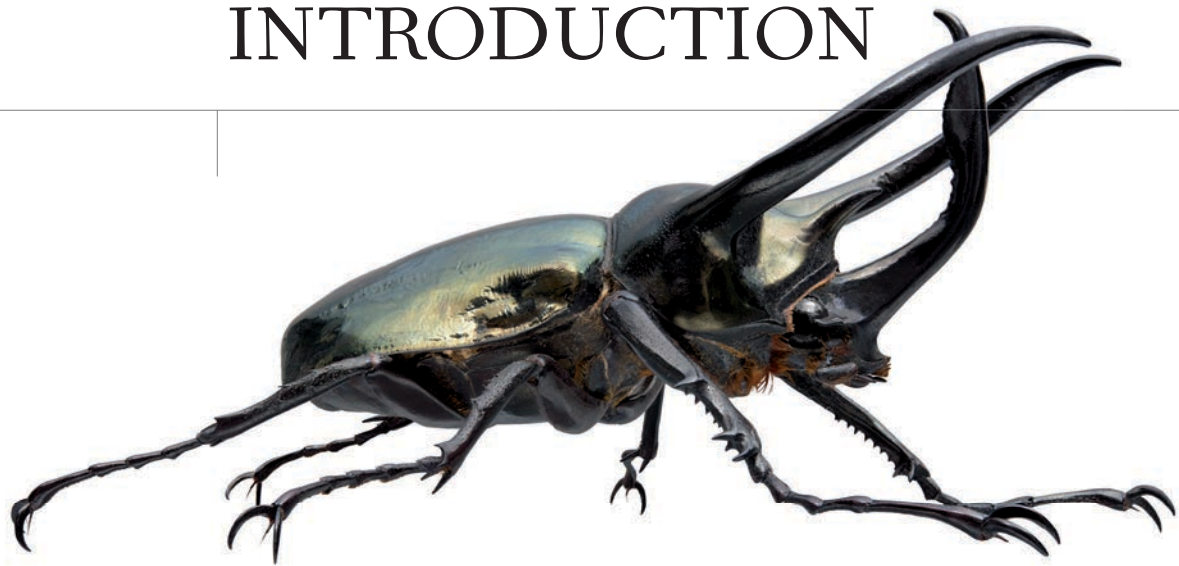
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# INTRODUCTION



*“From the small size of insects, we are apt to undervalue their appearance. If we could imagine a male Chalcosoma with its polished, bronzed coat of mail, and vast complex horns, magnified to the size of a horse or even of a dog, it would be one of the most imposing animals in the world.”*

CHARLES DARWIN, *THE DESCENT OF MAN, & SELECTION IN RELATION TO SEX*, 1871

**ABOVE Beetles** represent an exceptionally diverse group of organisms. Their importance for agriculture, forestry, culture, and science, and endless variations in structures (e.g., the male Atlas Beetle, *Chalcosoma atlas*) and microhabitat adaptations, have captivated humans for centuries.

Beetles of the order Coleoptera, with nearly 400,000 described species, comprise one of the most diverse and important groups of animals on Earth. As such, *coleopterists*, biologists who specialize in the study of beetles, have a view of the natural world with a degree of resolution that is seldom seen through the study of other organisms.

One out of every five species of plants and animals is a beetle. Despite their riot of forms, colors, patterns, and behaviors, all beetles share a select suite of physical attributes, the most conspicuous of which are the leathery

or hardened forewings, or *elytra* (singular *elytron*). Depending on the species, elytra can help stabilize beetles in flight, protect their delicate hind wings and internal organs, conserve precious bodily fluids, capture bubbles of air underwater, and insulate them from extreme temperatures. Combined with their small and compact bodies and numerous other morphological and behavioral adaptations, beetles exploit and thrive in niches unoccupied or underutilized by other animals in widely diverse terrestrial and freshwater habitats.

Although the sheer number of species prevents all but the most common or economically important beetles from having a meaningful and widely accepted common name, each known species does have a scientific name consisting of a *genus* (plural *genera*) and *species* (singular and plural) epithet that is universally recognized. To manage information effectively, coleopterists file each species into a nested system of hierarchical groups, or *taxa* (singular *taxon*), based on their shared evolutionary characteristics. Species is the most exclusive taxon, while the order Coleoptera is the most inclusive of beetle taxa.

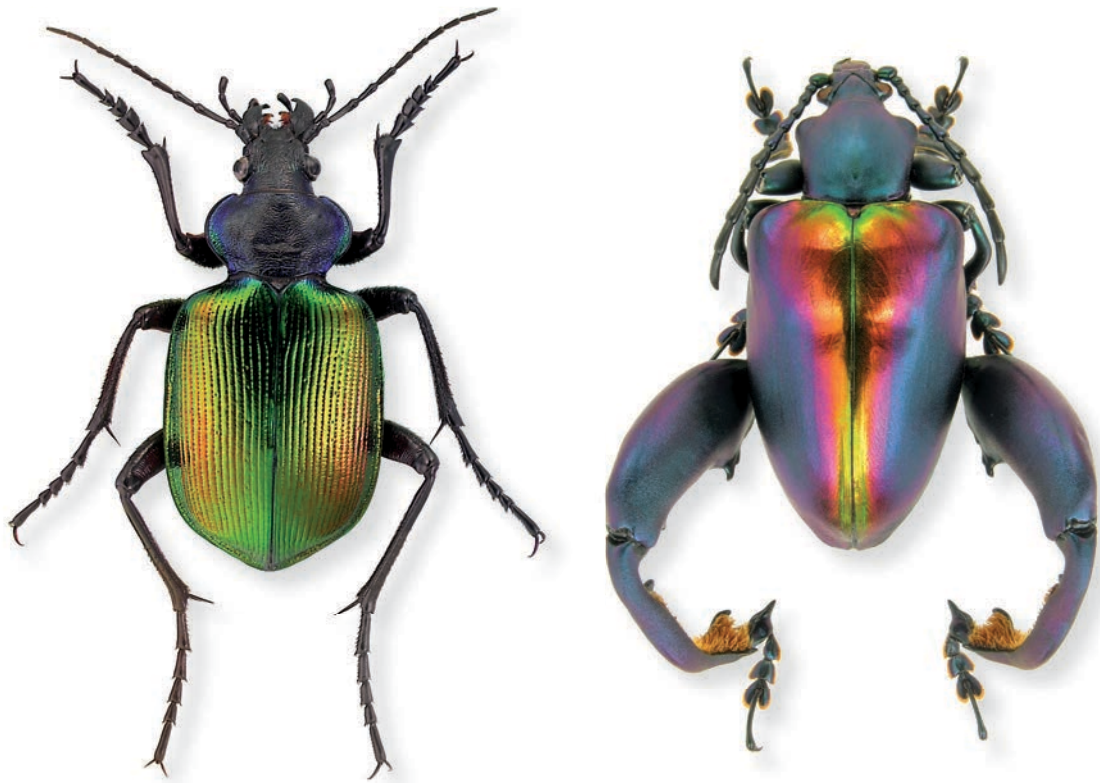
Beetles communicate with one another through physical, chemical, or visual means, usually to locate a mate. Although most species engage in sexual reproduction, a few reproduce asexually by cloning themselves, a process known as *parthenogenesis*. Among beetles, limited parental care of the young is the exception, not the rule. The larvae and adults eat a variety of organisms, living and dead, especially plants. Those that prefer leaves, flowers, fruits, needles, cones, and roots can inflict serious damage to food stores, gardens, crops, and managed timber. Some carnivorous beetles are used as biological control agents against agricultural or forestry pests, while scavenger species provide an essential service to clean study skeletons in natural history collections around the globe. Recently, the study of beetle structure and function has inspired scientists and engineers



**ABOVE Some beetles** feed on a single plant species; others feed on a wide range of hosts. Adults of the North American pest the Japanese Beetle (*Popillia japonica*) have been observed feeding on 300 hosts in approximately 80 plant families.

**BELOW Most beetles** are winged, but some have reduced hind wings and cannot fly, such as species in the African weevil genus *Brachycerus*.





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ABOVE **One of the most** challenging tasks for this project was to select the 600 candidate beetles to cover from the overwhelming number of species. While some species such as the Agreeable Caterpillar Hunter (*Calosoma sycophanta*) (left) are visually attractive and well known biologically, others such as the Frog-legged Leaf Beetle (*Sagra buqueti*) (right) have notable unusual adaptations yet little is known about their biology. We hope that this book will stimulate the discovery and publication of new knowledge on beetles from around the world.

working in the rapidly growing field of *biomimetics* to develop and design new materials and products ranging from iridescent car paint and reusable adhesive tape to monetary security systems.

*The Book of Beetles* offers a glimpse of this incredible diversity through an overview of 600 beetle species presented within a framework based on their evolutionary relationships. The diversity of beetles is divided by species into four main chapters of the suborders. Within each section the arrangement is taxonomic, by family and then subfamily, and then within each subfamily in scientific name (genus, species) order.

#### SELECTION CRITERIA

The species were selected on the basis of several criteria, offering a unique taxonomic survey of the majority of beetle families from around the world:

*Scientifically compelling* Subjects of focused scientific research or medicinal use, or inspirations for biomimetic and technological innovation.

*Curious natural histories* Unusual adaptations, ability to live in extreme habitats, interesting symbioses, or engaging behaviors.

*Culturally significant* Mythological and religious symbols, uses in folk medicine, or entomophagy.

*Economically important* Pest species, use as biological control agents, sources of products and services, or with a role in forensic entomology.

*Conservation* Rare and threatened species.

*Physically impressive* Large, colorful, horned, or exaggerated or unusually developed legs or mouthparts—species with special structures involved in specific behavior that has evolved through natural selection over millions of years and thus carries interesting underlying genetic information.

Each species is depicted by a razor-sharp life-size photograph and accompanied by a summary of its known distribution, habitat, and feeding habits. The map offers an indication of its global distribution, while the engravings afford readers another point of view. The scientific and common (if any) names are also provided, followed by the species' author and year of description. Concise narratives covering natural history and related species are followed by a brief species diagnosis.

#### BEETLE COLLECTIONS

Beetle collections carefully assembled over decades by thousands of dedicated professionals and amateurs provide essential data needed to identify and map sensitive species within a historical context. These scientifically valuable collections also serve as important resources for other scientific and educational endeavors, such as providing the specimens photographed for this book.

BELOW **Millions of insects**, including beetles, are preserved in natural history collections throughout the world. Specimens are typically dried and pinned, with a label attached to the same pin that includes important information such as the locality where the individual was encountered, the date it was collected, and the person who found it. Specimens are then placed in boxes or drawers, such as this one from the Alfred Russel Wallace (1823–1913) collection in the Natural History Museum, London, in order to protect them from museum pests and improve long-term preservation.

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RIGHT **The forewings** of beetles are uniquely modified into hardened, non-foldable elytra that meet together in a straight line over the body when at rest. The elytra partly or completely cover the abdomen and can be opened to deploy the hind wings, as in this *Lucanus cervus* individual.



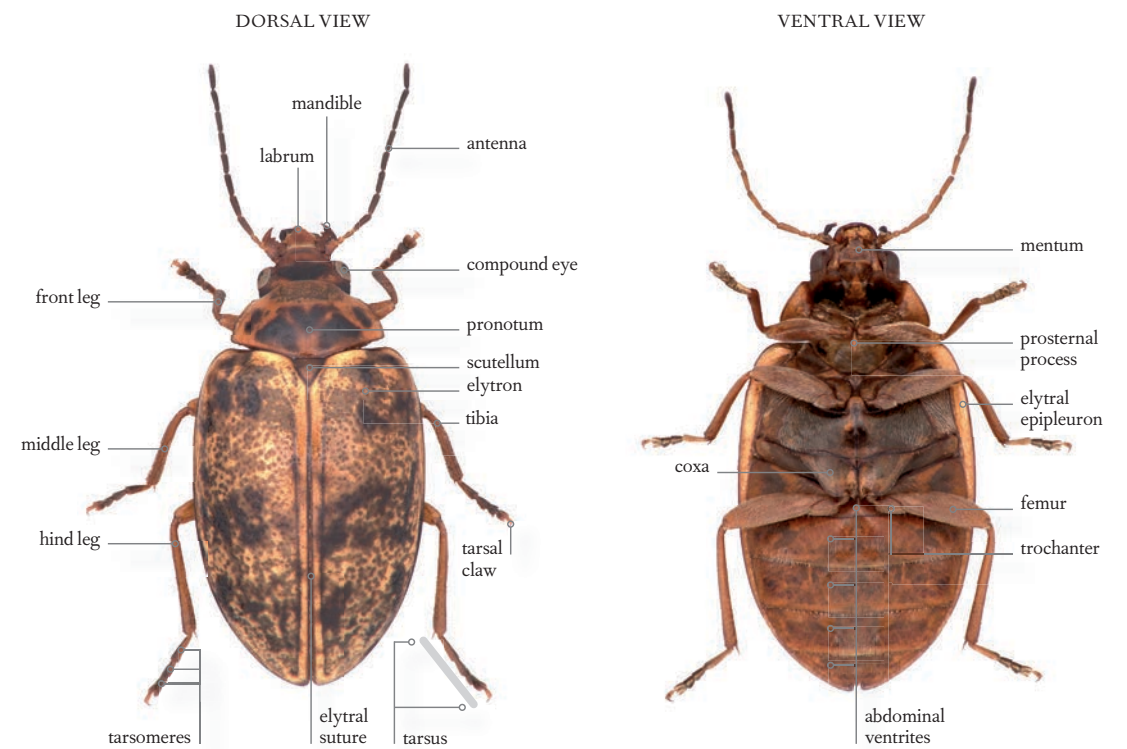
## WHAT IS A BEETLE?

The English word “beetle” comes from the Middle English *bityl* or *betyll* and the Old English *bitula*, all of which mean “little biter.” Other commonly used names, such as “weevil” and “chafer” derived from Old English and Old High German, also relate to biting. Coleoptera, first coined by Aristotle in the fourth century bce and later adopted as an order of insects by Carl Linnaeus in 1758, is derived from the Greek words *koleos*, meaning “sheath,” and *pteron*, or “winged,” and was inspired by the tough elytra of beetles.

### DISTINGUISHING FEATURES

Among other adaptations, beetles are distinguished from other insects by their chewing mouthparts, the conversion of their forewings into hardened elytra, their hind wings that fold lengthwise and across beneath the elytra, and their *holometabolous development*. Holometabolous insects pass through four very distinct life stages: egg, larva, pupa, and adult. The larvae and adults frequently differ in habits and habitat, functioning in the environment as if they were two separate species.

Beetles, like other insects, crustaceans, arachnids, millipedes, centipedes, and their kin with segmented exoskeletons and jointed appendages (antennae, mouthparts, legs), are classified in the phylum Arthropoda. Light and durable, the beetle exoskeleton is incredibly tough and rigid or characteristically soft and pliable, and provides protection and support. It serves as a platform for important tactile and chemosensory structures externally, while providing an internal framework that supports muscles and organs. The exoskeletal surface is smooth and shiny, or dulled by waxy



secretions or microscopic networks of cracks (*alutaceous*) resembling that of human skin. The surface is variously festooned with spines, hairlike *setae*, or flattened setae called *scales*, and sculpted with tiny bumps (*tubercles*), pit-like *punctures*, *ridges*, grooves (*striae*), or rows of punctures.

### COLOR

The colors of beetles are derived either from chemical pigments obtained from their food or structural properties of the outer layers of the exoskeleton. Most beetles are black as a result of melanin deposition during *sclerotization*, the chemical hardening process of the exoskeleton that occurs after emergence from the pupa, or *eclosion*. Microscopic surface sculpturing also influences beetle colors, as do patterns of setae, scales, or waxy secretions. Black desert darkling beetles (Tenebrionidae) are sometimes partially or completely covered with a white, yellow, or bluish-gray waxy bloom that reflects light and helps to keep the beetle cool.

The brilliant iridescent and metallic colors of beetles are created by multiple reflective layers in the exoskeleton and scales, or a layer of highly complex photonic crystals that reflect light at different wavelengths to create specific metallic colors and shimmering iridescence. These structures are determined genetically, but their final form in individual beetles is determined by conditions experienced during growth and development.

ABOVE **The study** of a superdiverse group of organisms such as beetles requires the close examination of a wide range of anatomical structures in order to recognize and classify species and larger groups correctly. Using clear and consistent terms for these structures is essential to clearly communicate results amongst those who are specialists and non-specialists.



FAMILY	Staphylinidae
SUBFAMILY	Aleocharinae
DISTRIBUTION	Nearctic: North America, north of Mexico
MACROHABITAT	Forests
MICROHABITAT	Nests of formicine ants
FEEDING HABITS	Adults and larvae are fed by hosts through trophallaxis
NOTE	A specialized nest parasite of formicine ants

ADULT LENGTH  
Adult length:  $\frac{3}{16}$ – $\frac{1}{4}$  in  
(5.3–6.4 mm)



*XENODUSA REFLEXA*  
**XENODUSA REFLEXA**  
(WALKER, 1866)



Actual size

Adults and larvae of *Xenodusa reflexa* are adapted to an obligate association with formicine ants and spend most of their lives in ant nests. Specialized glandular setae on the adult abdomen produce appeasement chemicals that are attractive to host ants. Both adults and larvae are fed by regurgitation by the ants (trophallaxis). They are considered nest parasites because beetle larvae compete with ant larvae for care and feeding by the ants. Ants in the genus *Camponotus* are the most frequently documented hosts for this species, but other species breed in *Formica* nests and overwinter in *Camponotus* nests.

#### RELATED SPECIES

Four species of the genus *Xenodusa* occur in USA and southern Canada, and an additional species occurs in Mexico. *Xenodusa reflexa* is the most widely distributed species. It differs from species that overlap in ranges by its relatively larger size ( $\frac{3}{16}$  in, or 4.5 mm) and hairy ventral surface. A widespread eastern species, *X. cava*, is similar, but lacks long hairs on the ventral surface of the body.

*Xenodusa reflexa* is a comparatively large, mahogany brown member of the rove beetle tribe Lomechusini. The broad, reflexed pronotum and unusual trichome bundles along the abdomen are characteristic of the genus. Similar glandular trichomes are found on various parts of the bodies of other myrmecophilous beetles, and presumably also function in producing and distributing glandular appeasement chemicals.



FAMILY	Staphylinidae
SUBFAMILY	Scaphidiinae
DISTRIBUTION	Oriental: Sumatra and Sulawesi, Indonesia; Sarawak, Malaysia
MACROHABITAT	Tropical forests
MICROHABITAT	Fungus on logs and standing dead trees
FEEDING HABITS	Fungivorous
NOTE	The neck may be twice the body length

ADULT LENGTH  
 $\frac{1}{2}$ – $\frac{3}{4}$  in  
(13–20 mm)



*DIATELIUM WALLACEI*  
**LONG-NECKED SHINING FUNGUS BEETLE**  
PASCOE, 1863

From the head back, this remarkable insect looks like a typical member of the tribe Scaphidiini of the subfamily Scaphidiinae, but the extremely elongate neck in both sexes render it unique among rove beetles. The biology of the species is poorly known, but other members of the subfamily graze on fleshy or encrusting fungi on dead wood or other organic substrates in forest habitats as both adults and larvae. Adults may be encountered on exposed fungal surfaces day or night. They are wary and prone to flight or dropping, requiring a slow, stealthy approach if observations or photographic efforts are to be successful.

#### RELATED SPECIES

This species is placed in the same tribe as the enormous genus *Scaphidium* based on recent phylogenetic studies and general appearance, exclusive of the outsized neck. It is not likely to be confused with any other animal within its range, but some African brentid weevils have elongate forebodies comprising parts of the thorax and neck that are superficially similar.



Actual size

The Long-necked Shining Fungus Beetle is unique among rove beetles and perhaps all beetles in possessing an extremely long neck that may be twice the length of the body in some male specimens. The neck is longer on average in males but its length is variable in both sexes.





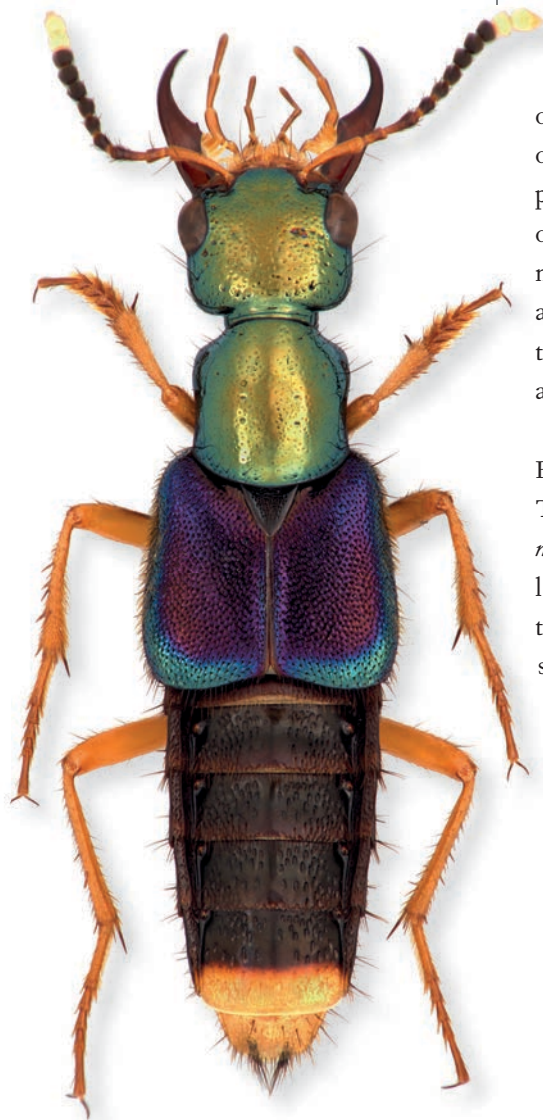
FAMILY	Staphylinidae
SUBFAMILY	Staphylininae
DISTRIBUTION	Australian: New Guinea and extreme northern Australia
MACROHABITAT	Tropical forests
MICROHABITAT	Leaf litter, dung, carrion
FEEDING HABITS	Predatory on flies
NOTE	Preys on flies associated with animal carcasses

ADULT LENGTH  
5/8–7/8 in  
(16–22 mm)



*ACTINUS IMPERIALIS*  
**ACTINUS IMPERIALIS**  
FAUVEL, 1878

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Adults of this unusually large and gaudily colored rove beetle frequent smelly substrates such as carrion and dung that are likely to attract flies. Adults actively seek out and destroy predators that feed on maggots and opportunistically capture adult flies. The immature stages presumably share the predatory habits of the adults but details of their biology are not well documented. One source mentions an association with cardamom, without giving additional details. Adults exhibit strong sexual dimorphism of the mandibles and head, with males often having larger heads and longer mandibles than females.

#### RELATED SPECIES

Two similar species are known from the genus, with *Actinus macleayi* from northern Australia differing mainly in having a less strongly punctured head and pronotum, in addition to other minor differences. In other respects *A. imperialis* superficially resembles other large members of the staphylinid subtribe Philonthina, but few are as brightly colored.



Actual size

***Actinus imperialis*** is unusually large for a staphylinid beetle, with a metallic green head and pronotum and brilliant metallic purple elytra. The abdomen possesses a triangular orange spot near the posterior end. The punctures on the head are diagnostic for this species.



FAMILY	Staphylinidae
SUBFAMILY	Staphylininae
DISTRIBUTION	Neotropical: central South America
MACROHABITAT	Forests near rivers and streams
MICROHABITAT	The body and nests of South American Water Rats ( <i>Nectomys squamipes</i> )
FEEDING HABITS	Predatory on fleas
NOTE	Phoretic on small mammals and found in their nests feeding on fleas

*AMBLYOPINODES PICEUS*  
**AMBLYOPINODES PICEUS**  
(BRÈTHES, 1926)

ADULT LENGTH  
1/4–5/16 in  
(6.5–7.5 mm)



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Members of this species and others in the tribe Staphylinini, subtribe Amblyopinina are unique among rove beetles in their adaptations to life on the bodies and in the nests of small mammals, mainly rodents. Adults of this species grasp the hair and skin between the ears of South American Water Rats (*Nectomys squamipes*) and travel with the animal, and the larvae occur in water rat nests. Early entomologists thought these beetles were parasitic on the animals, but later researchers revealed that they are predators of fleas and serve a beneficial function for the rats by reducing flea populations in their nests. The flattened morphology of the beetle's head is similar to that of other unrelated species that live on mammals.

#### RELATED SPECIES

At least five other species of the genus occur in the same region. Identification of species is based on examination of internal male sex structures and, to a lesser extent, the arrangement of specialized hairs on the body. Other genera of the tribe are similar and may be distinguished using available keys and by mammal host associations.

***Amblyopinodes piceus*** is an elongate, somewhat flattened, somber-colored rove beetle. The head in particular is unusually flattened and the mandibles are adapted to grasping mammal hairs. Elongate, movable hairs on the underside of the abdomen are unique to the genus.



Actual size





FAMILY	Scarabaeidae
SUBFAMILY	Scarabaeinae
DISTRIBUTION	Palaearctic: southern and central Europe, North Africa, Middle East, portions of Asia
MACROHABITAT	Steppe, forest-steppe, and semidesert
MICROHABITAT	In the vicinity of accumulations of fresh dung
FEEDING HABITS	Adults strain nutrients from dung; larvae eat solid waste
NOTE	Regarded as a sacred symbol by the ancient Egyptians

ADULT LENGTH  
1½–1⅞ in  
(26–40 mm)



## SCARABAEUS SACER SACRED SCARAB BEETLE

LINNAEUS, 1758

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Actual size

*Scarabaeus sacer* uses its raked forelegs to fashion balls from fresh dung, then lays an egg inside the ball before rolling it away and burying it. The grub feeds and completes its development inside the ball. These beetles were revered in ancient Egypt as symbols of Khepri, a manifestation of the sun god Ra, because their dung-rolling activities were considered symbols of the forces that moved the sun, represented by the dung ball, across the sky. The species was also associated with rebirth, and the beetles, along with their likenesses carved in stone, were frequently buried with the dead.

### RELATED SPECIES

*Scarabaeus* contains 139 species in four subgenera that inhabit Afrotropical, Palearctic, and Oriental regions. These small to relatively large dung beetles have four distinct teeth across the clypeus, anterior coxae and femora that are not enlarged, and lack front tarsi. *Scarabaeus sacer* is distinguished from other Palearctic species, in part, by the finely notched posterior pronotal margin, and the features of the middle and hind tibiae.

**The Sacred Scarab Beetle** has a broad, smooth patch and narrow groove along the posterior margin of the pronotum. The middle tibiae each have two oblique rows of short setae. The tips of the posterior tibiae are prolonged, forming a narrow plate beneath the tarsus. Males have a reddish fringe of setae along the inner margins of their hind tibiae.



FAMILY	Scarabaeidae
SUBFAMILY	Scarabaeinae
DISTRIBUTION	Neotropical: northern Argentina, southern Bolivia, western Paraguay
MACROHABITAT	Dry forest, dry thorn forest, and pasture
MICROHABITAT	Often found in pastures in cattle-raising areas
FEEDING HABITS	Adults commonly found in cattle dung
NOTE	This is the most colorful and variable species of <i>Sulcophaneus</i>

## SULCOPHANEUS IMPERATOR SULCOPHANEUS IMPERATOR

(CHEVROLAT, 1844)

ADULT LENGTH  
⅞–1⅞ in  
(18–28 mm)



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*Sulcophaneus imperator* adults reach their peak of activity from January to March. They fly during the day in search of fresh feces of humans and various domesticated animals, and can be common in cattle pastures. They typically work in pairs to dig their nests directly beside or underneath animal droppings. Males push plugs of dung down the tunnel to females that fashion them into brood balls within the brood chamber. Dung burial reduces the loss of pasturage due to the growth of rank herbage, releases nutrients back to the soil, and disrupts the life cycles of pest organisms developing in the feces.

### RELATED SPECIES

The genus *Sulcophaneus* consists of 14 species, all but four of which occur in South America. Three of the latter species inhabit Central America, including an endemic, while the fourth species is endemic to Jamaica. With its green, gold, and red color forms, *Sulcophaneus imperator* is by far the most colorful and variable species in the genus.

**Sulcophaneus imperator** is a large and bulky beetle that is dull to weakly shining black mixed with brilliant metallic greens, golds, and blues, and coppery red reflections. Males have a distinct backward-pointing horn on the head, while the females lack this armature. Both males and females have front tarsi.



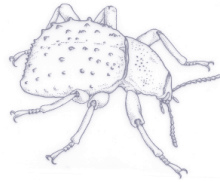
Actual size





FAMILY	Tenebrionidae
SUBFAMILY	Stenochiinae
DISTRIBUTION	Endemic to Frégate Island, Seychelles
MACROHABITAT	Tropical forest
MICROHABITAT	Adults and larvae are most commonly associated with <i>Pterocarpus indicus</i>
FEEDING HABITS	Decaying wood and bark
NOTE	Known only on Frégate Island, a 0.8 sq miles (2 sq km) island in the Indian Ocean

ADULT LENGTH  
1–1 $\frac{1}{16}$  in  
(25–30 mm)



*POLPOSIPUS HERCULEANUS*  
**FRÉGATE ISLAND GIANT  
TENEBRIONID BEETLE**

SOLIER, 1848



Actual size

**Frégate Island Giant Tenebrionid Beetle** adults are pale gray to dark brown and have broadly rounded elytra in dorsal view, which are covered by a small number of apically rounded and shiny tubercles. The elytra are completely fused along the midline, and flight wings are absent. The legs are relatively long and males have curved tibiae.

The Frégate Island Giant Tenebrionid Beetle is one of 12 beetle species ranked Critically Endangered on the International Union for Conservation of Nature's Red List of Threatened Species (see also the Delta Ground Beetle, *Elaphrus viridis*, and American Burying Beetle, *Nicrophorus americanus*), and is restricted to Frégate Island in the Seychelles. The accidental introduction of Brown Rats (*Rattus norvegicus*) to the island in 1995 nearly caused the extinction of the flightless beetle, along with the endemic Seychelles Magpie-robin (*Copsychus sechellarum*), before the rodents were eradicated in the early 2000s.

#### RELATED SPECIES

Flightless tenebrionid genera were previously grouped together on the basis of the absence of flight wings and their sealed elytra. Recent studies on internal organ systems such as the defense glands and the female genital tube now suggest that the older classification did not reflect natural groupings. Although the monotypic genus *Polposipus* belongs to the diverse subfamily Stenochiinae based on internal characters, its closest relatives have not yet been established.

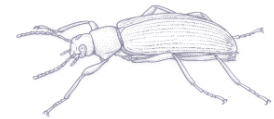


FAMILY	Tenebrionidae
SUBFAMILY	Stenochiinae
DISTRIBUTION	Neotropical: from Mexico south to Bolivia
MACROHABITAT	Tropical forests
MICROHABITAT	Adults live on the surface of trees or under bark, and larvae in wood
FEEDING HABITS	Immature stages probably develop in decaying wood
NOTE	One of the most diverse and colorful genera in the family Tenebrionidae

*STRONGYLIUM AURATUM*  
**STRONGYLIUM AURATUM**

(LAPORTE, 1840)

ADULT LENGTH  
 $\frac{1}{2}$ – $\frac{3}{4}$  in  
(12–19 mm)



Based on the abundance of darkling beetles in most dry environments on the planet, many people assume that all species in this family are dark brown to black and are ground-dwellers. This is clearly not the case for species in the tribe Stenochiini, which includes the colorful forest-dwelling genera *Strongylium* and *Cuphotes*. *Strongylium* is certainly one of the most species-rich genera in the family, with nearly 1,000 described species and many more undescribed, especially in tropical areas. *Strongylium auratum* is relatively abundant in Neotropical forests and can be encountered at elevations of 5,000 ft (1,500 m) and more.

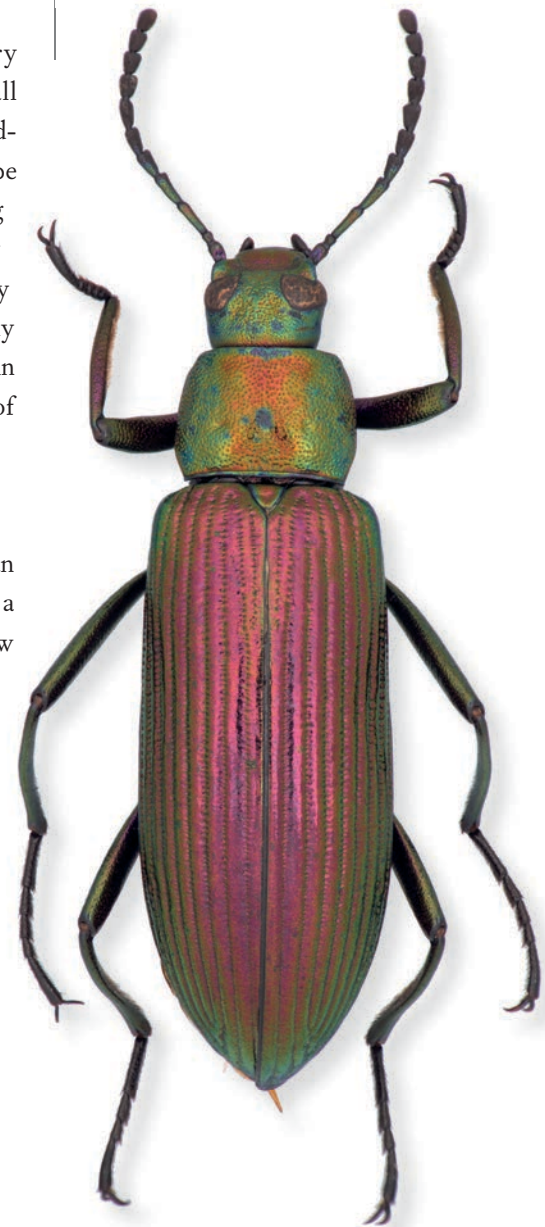
#### RELATED SPECIES

The overwhelming diversity in *Strongylium*, coupled with an almost complete lack of comparative studies of its species, is a major impediment to taxonomic and biological studies. New species continue to be described every year, however, primarily based on differences in color patterns, sculpture of their cuticle, and sexual characters. Although most species are elongated and have well-developed flight wings, such as *S. auratum*, others are flightless and more convex.



Actual size

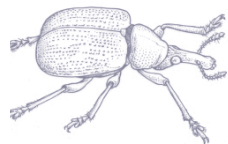
**Strongylium auratum** is an elongated beetle with bright metallic green to reddish-purple reflections on the dorsal surface and legs. Each elytron has nine distinct rows of transverse punctures. Antennae are rather long, reaching beyond the base of the pronotum. Antennomeres are slightly wider at their apex and are speckled with small circular white sensory structures. The last two abdominal ventrites are contrasting yellow-reddish in color.





FAMILY	Attelabidae
SUBFAMILY	Rhynchitinae
DISTRIBUTION	Palaearctic: China, Japan, Kazakhstan, Korea, Mongolia, Russia
MACROHABITAT	Forest
MICROHABITAT	Leaf rolls, vegetation
FEEDING HABITS	Host plants include species of <i>Malus</i> , <i>Pyrus</i> , <i>Sorbaria</i> , and <i>Populus</i>
NOTE	The males are known for their wrestling behavior

ADULT LENGTH  
1/4–5/16 in  
(6.5–8 mm)



*BYCTISCUS RUGOSUS*  
**BYCTISCUS RUGOSUS**  
(GEBLER, 1830)

594

Ritualized contests and aggressive fighting behavior are known to occur between males of species in this genus. The males extend their forelegs outward while rearing up on their mid and hind legs, grabbing each other with their forelegs and touching their rostra. The elongate tarsal setae may help enhance visual displays of this aggression. Females of the charismatic *Byctiscus rugosus* roll leaves into complicated cylindrical tubes for the reception of the egg. The larva feeds within the tube, where it completes its development.

#### RELATED SPECIES

*Byctiscus* includes 27 species from the Palearctic and Oriental regions. Species are classified into two subgenera: *Byctiscus* and *Aspidobyctiscus*. The tribe Byctiscini has an exclusively Old World distribution and includes 12 genera in two subtribes. The related Pear Leaf-roller Weevil (*B. betulae*) is known to cause damage to grapevines, pears, and other broadleaved trees and shrubs.



Actual size

*Byctiscus rugosus* is a bright metallic, shiny green weevil with reddish reflections on the head and legs. The elytra are covered with prominently punctate striae. The pronotum is narrower than the base of the elytra, which are quadrate. The head is narrow and the rostrum is almost twice as long as the head. The antennae are not elbowed and emerge near the apex of the rostrum; the last three antennomeres are almost twice as wide as the preceding ones.



FAMILY	Attelabidae
SUBFAMILY	Rhynchitinae
DISTRIBUTION	Nearctic and Neotropical: USA (Arizona, New Mexico, Texas), Mexico (Chihuahua, Sonora, Oaxaca)
MACROHABITAT	Oak forests
MICROHABITAT	Foliage, leaf litter
FEEDING HABITS	Epidermal tissue of <i>Quercus</i> spp.
NOTE	The larvae are leaf-miners

ADULT LENGTH  
1/4 in  
(5.7–6.3 mm)



*EUGNAMPTUS NIGRIVENTRIS*  
**EUGNAMPTUS NIGRIVENTRIS**  
(SCHAEFFER, 1905)

595

This species exhibits maternal care by individually placing each egg between the epidermal layers of a dead leaf of the host tree (oaks, *Quercus* spp.). In spring, a female uses her mandibles to cut an oviposition scar on a leaf that dropped to the ground the previous fall. She then oviposits a single egg into a cavity she created between the upper and lower epidermis and seals the epidermal tissue by pinching with her mandibles. The larva completes its entire development by feeding on the epidermal tissues of the dead leaf. Pupation takes place in the soil and adults emerge the following spring.

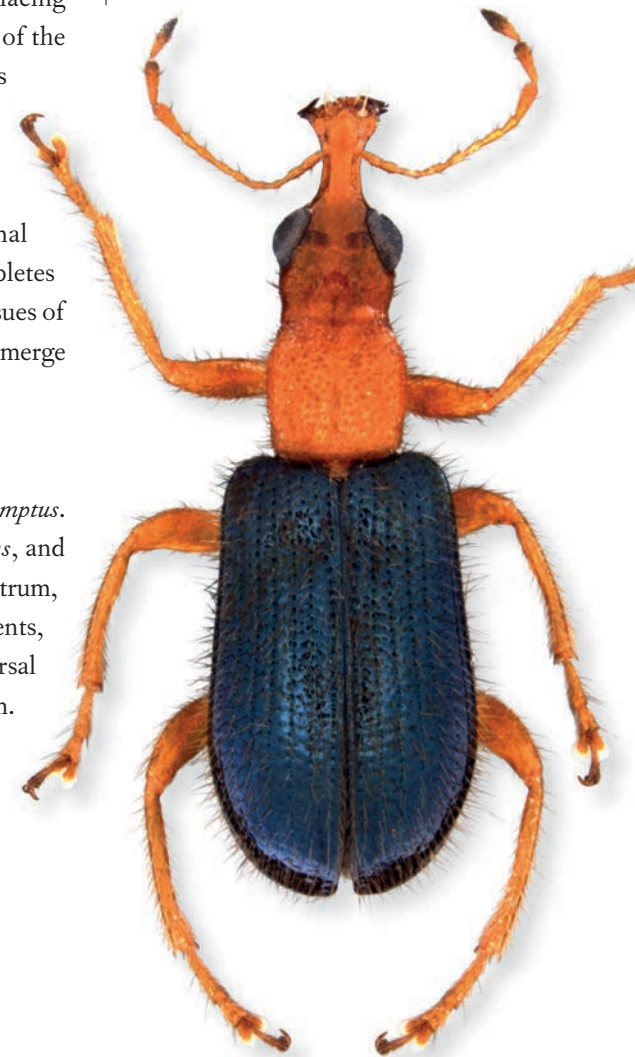
#### RELATED SPECIES

There are approximately 100 species included in *Eugnamptus*. *Eugnamptus* is similar to *Hemilypus*, *Acritorrhynchites*, and *Essodius*, but can be distinguished by characters of the rostrum, distance between the eyes, length of basitarsal segments, prominence of the first abdominal suture, extent of dorsal punctation, and elytral length as it relates to the pygidium.



Actual size

*Eugnamptus nigriventris* is clothed in fine, erect setae and has a reddish head, pronotum, and legs, and bluish-green elytra. In the male, the length of the rostrum is shorter than the length of the head and the antennae are inserted close to the apex. In the female, the rostrum is longer than the head, and the antennae are inserted near the middle. The head and pronotum are narrower than the base of the elytra.





FAMILY	Brentidae
SUBFAMILY	Brentinae
DISTRIBUTION	Palaearctic: southern Europe, Algeria, Morocco, Israel, Syria, Iran, Russia
MACROHABITAT	Temperate humid forests containing predominantly oaks ( <i>Quercus</i> spp.)
MICROHABITAT	Nests of <i>Camponotus</i> , <i>Lasius</i> , <i>Crematogaster</i> , <i>Pheidole</i> , <i>Tapinoma</i> , and <i>Myrmica</i> ants
FEEDING HABITS	Uncertain
NOTE	Myrmecophilous; has an unusual head morphology

ADULT LENGTH  
 $\frac{3}{8}$ – $\frac{11}{16}$  in  
 (9–18 mm)



AMORPHOCEPHALA CORONATA  
**AMORPHOCEPHALA  
 CORONATA**  
 (GERMAR, 1817)

This species is a facultative ant associate, usually of *Camponotus* but tolerated, after minor hostility, by other ant groups. When introduced to a *Camponotus* colony, these brentids face aggression by the workers until the ants discover and begin to lick glandular secretions from pubescent areas on the beetle's head. Apparently, *Amorphocephala coronata* exhibits a pseudoaltruistic behavior, whereby it regurgitates to the colony part of the food received from host worker ants. Ants have been observed tending to these brentids and actively trying to retain them in their nest. The species is gregarious, with many individuals found together.

#### RELATED SPECIES

This genus belongs in the tribe Eremoxenini (which is sometimes treated as the subtribe Eremoxenina within the Brentini), an almost exclusively myrmecophilous group. Other genera in this group include *Cobaloecephalus*, *Eremoxenus*, and *Symmorphocerus*. *Amorphocephala* contains 20 species from the Palearctic and Afrotropical regions. The species can be separated mainly by characteristics of the head, prothorax and antennae.

*Amorphocephala coronata* is shiny reddish-brown beetle with a narrowly elongate body. Its most outstanding feature is its large, complex head, with the hind rostrum (just below the frons) deeply concave and bearing brushes of stiff setae. The head is sexually dimorphic, the males having a more robust front rostrum with large sickle-shaped mandibles, and the females having elongate, cylindrical mandibles.



Actual size



FAMILY	Brentidae
SUBFAMILY	Brentinae
DISTRIBUTION	Nearctic and Neotropical: USA (Florida) to Paraguay
MACROHABITAT	Tropical and subtropical
MICROHABITAT	Decaying wood; under bark
FEEDING HABITS	Adults feed on sap or visit flowers for nectar; larvae bore into dead wood and possibly feed on sap or fungal mycelia
NOTE	The species exhibits sexual dimorphism and is the largest weevil in North America

BRENTUS ANCHORAGO  
**BRENTUS ANCHORAGO**  
 (LINNAEUS, 1758)

ADULT MALE LENGTH  
 $\frac{3}{8}$ – $1\frac{5}{16}$  in  
 (9–50 mm)

ADULT FEMALE LENGTH  
 $\frac{5}{16}$ – $1\frac{1}{16}$  in  
 (8–27 mm)



Most brentid species exhibit sexual dimorphism and *Brentus anchorago* is no exception: Some individuals may be up to five times larger than the smallest. Both sexes engage in combat, and those with longer bodies and rostra, which are used as weapons, are more successful in securing a mate. There is an overall preference by both sexes for larger mates, thus skewing populations toward larger-bodied individuals. Females chew holes into the decaying wood of primarily Gumbo-limbo (*Bursera simaruba*) trees to oviposit. Adults can be readily found in large numbers under the bark of dead logs.

#### RELATED SPECIES

*Brentus* and *Cephalobarus* are currently classified in the Neotropical tribe Brentini. Thirty-seven species are included in *Brentus*. Of these, *B. cylindrus* has been reported from Polynesia (Marquesas, Tahiti), where it is possible that it was introduced. The first brentid species described by Linnaeus in 1758 were *B. anchorago* and *B. dispar*, originally under the genus *Curculio*.



Actual size

*Brentus anchorago* is a greatly elongate black weevil with reddish-orange vittae on the elytra. It is one of the largest weevil species in North America. Males are strikingly longer, with the long, slender prothorax narrowing in the middle and the elongate, narrow rostrum about as long as the prothorax. Females have a tear-shaped prothorax, broadening basally, and a rostrum that is about half the size of the prothorax.

