



Big Bend Dung Beetles

Text and photographs by Dr. Dave Edmunds

If nothing else, insects are resourceful—some in more obvious ways than others, some in more surprising ways than others. But perhaps none are more surprising and obvious among the common denizens of the Big Bend country than dung beetles—the industrious insects that make a living from cowpies and similar food sources in pastures, corrals, along trails, and even in some of the most out-of-the-way places one would expect. In the summer fresh dung pads are often literally covered by hundreds of

beetles each jostling for position to claim a part of the larder for itself. The first task each contender has is to capture a share of the booty. Using its head and long legs the dung beetle gathers up a quantity of food which it rapidly and efficiently rolls into a perfect ball—its prize for quick and thorough work. The next task is to escape the crowd with its prize. Again using its long hind and middle legs it rolls the ball away—sometimes a long way from where it was made. The third task is to protect what has taken a lot of effort to obtain; this the beetle does by using its head and front legs to dig beneath the ball until the beetle and ball gradually sink out of sight into a private, underground space.

Here, completely unmolested by its brethren and protected from the hot, dry conditions on the surface, the dung beetle can pursue one of two basic urges: if not yet fully mature, the dung ball prize will become a meal. If the beetle is a sexually mature female, she will reshape the dung into a pear-shaped ball and lay a single egg in its narrow end. In either case, once business is done, the beetle will return to the surface to repeat the sequence for the remainder of its adult life.

A large dung pad worked by a crowd of dung beetles will be reduced to a carpet of duff in a surprisingly short period of time—sometimes less than a day. These ball-rolling dung beetles—much more commonly referred to as “tumblebugs” for an obvious reason—are very common in a lot of places and have forever attracted attention because of their curious life style. Their long legs

and expansive embrace of their dung balls have also earned these beetles the moniker “straddlebugs.” Straddlebug Mountain on the O2 Ranch south of Alpine is the cowboys’ tip-of-the-hat to these “get-it-done” insects.

But not all dung beetles pursue life as tumblebugs. In fact, most don’t. These beetles are more clandestine and harder to observe. The clues to their presence on the scene are small piles of dirt around the edge—or sometimes on top of—a mound of dung. Rather than making and rolling away a ball, these beetles dig a tunnel underneath the food source and, after repeated trips to the surface, gather enough “armfuls” of dung to make a tightly packed “sausage” in the end of the burrow. This sausage has the same function as the tumblebug’s ball of dung: the beetle can feed on it or use it as food for its larvae.

The ball rolling and tunneling behaviors both ultimately achieve the

same overarching result: sequestering a quantity of food in a protected place where it can be consumed by the adult or used as provision for its young. The fact that dung beetles—presumably all of the 6500 or so species we know about so far—make special efforts to house and provide their offspring with the food they need to complete development place them, along with ants, termites, birds, some mammals, reptiles and others, in the special category of nesting animals. A discussion of the various ways dung beetles perform their nesting duties is beyond the scope of this article. Suffice it to say that they are very good at it. Unlike the vast majority of insects for which reproduction yields legions of offspring—each with a miniscule probability of survival—dung beetles have very low birth rates (some species fewer than 10 offspring per female) and very high survivorship. Not much will bother a dung beetle larva in



▲ A dung beetle moves a ball of dung away from its competitors. It will eventually dig a tunnel to store the dung for food for itself or its offspring. Photo by C. Hoyt.

its own private underground chamber with enough food (thanks to mom, and sometimes also dad) to complete its development to adulthood. Dung beetles take good care of their kids!

Besides the fact that they are attention getters from a biological point of view—with a unique functional morphology and behavior—dung beetles have in recent years become recognized as an important bioindicator group. Because it is not possible to know, let alone sample all of the animal populations in a given habitat or biome, biologists have long focused on representative target groups to make overall judgments about such things as community structure and richness, biodiversity and the effects of natural and human induced disturbances on the interactions, survival and conservation and environmental quality monitoring and management.

Traditionally the role of bioindicator groups has been relegated to vertebrates (especially mammals and birds) and plants. Invertebrates in general—and insects in particular—have been largely ignored. In recent years scientists—especially ecologists and environmental management specialists—have studied closely what characteristics make for good (= reliable) bioindicator groups. Dung beetles score very highly. As a result, there has been a strong resurgence in basic pick-and-shovel community composition, taxonomic, and structural studies of the kind ornithologists and mammalogists, for example, have been doing for decades.

Most of the work on dung beetle communities has been done in the

tropics. Practically all the temperate studies have been done in Europe. No one has cast an eye on the dung beetle fauna of a major North American desert region—until now.

For the past five years Dave Edmonds of Marfa has been conducting a long-term study of the dung beetle fauna of the Big Bend region of the Chihuahuan

Desert. Collections and field observations are being made of the communities present at several reference sites. Among the more important of these are the Miller Ranch of Presidio and Jeff Davis counties, the Davis Mountains Preserve, the Pinto Canyon Ranch, and the CDRI's Nature Center. Collectively these sites offer a compre



▲ Grassy woodlands and riparian areas serve as habitat for a number of dung beetle species.



▲ *Open, grassy scrublands are another favored habitat for dung beetles.*

hensive cross section of the major habitats of the Big Bend area. The purpose of this study is to compile a species survey of these beetles and to consider their ecological distribution and community relationships. These results will provide some of the basic faunistic information that ecologists and other field biologists will need to include these beetles in much more sophisticated analyses of the biodiversity of our area. Dave's preliminary conclusions will be published in a formal scientific paper in the near future—but the major ones can be summarized are these:

(1) The Big Bend dung beetle fauna is a young one—probably coming together in only the last 10,000 to 15,000 years. None of the known species is unique to our geographic area; all probably emigrated from similar places as the desert environment covered the re-

gion. Some species are scarce (probably only because no one yet knows how to collect them!), but none is threatened or in danger of regional extinction (local cycles of extinction and repopulation are a natural part of dung beetle community dynamics in our desert environment).

(2) The dung beetle fauna of the Big Bend is a diverse one—the most diverse of any North American desert known so far. Activity of adults is during the summer rainy season—as is true of practically all other studied dung beetle communities. The first soaking rains of the warmer summer months bring them out from their subterranean strongholds in sometimes amazingly large numbers. Five years of collecting has so far produced twelve species of dung beetles. Ten are native species, and two are African species that were introduced into eastern Texas as part

of a USDA project in the early 1970s. Since their introduction 30 years ago, these exotic beetles have extended their range throughout the state and southward through most of Mexico; they are tunneling dung beetles and often occur in very high densities along with some of the native species—especially in places where livestock are abundant.

(3) The desert environment is unpredictable in many ways, especially when it comes to where and how much it rains in a particular year. Trans-Pecos dung beetle communities have species that display one or the other of two basic strategies to confront the prevailing environmental uncertainty. The ball-rollers (tumblebugs) are especially good examples of the first strategy: that of the “wanderers.” They are strong fliers and move around a lot. They avoid inhospitable patches of the summertime desert scene by being able to seek out areas where conditions are ripe for eating and nesting. Thus, they tend to aggregate in large numbers, spend more time during the day foraging, and tend to be rather flexible in their choice of food—any kind of dung will do, and if that is in very short supply, they can switch temporarily to carrion or even rotting fungi and fruit. They also tend to be less choosy about habitat; they prefer the wide open spaces, but will readily enter woodlands, the entrances of canyons and arroyos, and other more closed places if that is where the good hunting is.

The second strategy is that of the “careful shoppers.” These specialists cope with the uncertainties of desert life by opting for associations with very

special habitats that provide a measure of stability and predictability. All of the “careful shoppers” are burrowers. These species seek out and confine their lives to cozy microhabitats—especially the subterranean nests of nesting mammals, such as packrats, kangaroo rats, and gophers. They move around carefully and confine their movements to canyons and arroyos (or large kangaroo rat communities in the flats) where their hosts congregate. Their diets are usually narrowly restricted to the dung of the mammal host—so they are never seen at a cowpie or horse biscuit—their lives are inextricably linked to their hosts’ living quarters. These special places serve as microrefuges much less susceptible to the vagaries of the more exposed lifestyle of the “wanderers.”

(4) Any kind of intensive field work creates more questions than it answers—and this is no less true of Dave’s work in progress. Among the outstanding questions so far are these.

Are there other species yet to be discovered in our area? Probably so. In fact there are a couple of species known from the area to our north into southeastern New Mexico that could be in some yet uncollected place in the Big Bend.

How do our native species share available resources? An interesting question indeed, and one for a field ecologist to tackle. A good place to start would be with our four ball-rolling species. These are closely related (in the same genus) and sometimes coexist at the same place—such as the Nature Center—with pretty much the same lifestyle.

How exactly do the species that live in mammal nests conduct their daily lives? An

interesting question that presents the unique challenge of going where they live without disturbing them or their hosts—bring on the pick and shovel and

the fiber optic video equipment!!

Do the exotic species negatively impact our native species? An interesting question and one that research should help

A Big Bend Dung Beetle Checklist*

The Ball-Rolling Species



Canthon imitator – a wanderer very common in grassland and scrub habitats.

Canthon humectus – a wanderer most common in grassy woodlands.

Canthon praticola – a wanderer very common in grassland and scrub habitats.

Canthon mixtus – a wanderer very common in grassland and scrub habitats.

Introduced Species



**Digitonthophagus gazella* and *Euo-niticellus intermedius* are the two introduced species; both burrowing wanderers very common in areas with livestock – wherever pastured practically anywhere in the state. Both are natives of Africa.

The Tunneling Species



Phanaeus triangularis – a wanderer living in grassy woodlands.



Onthophagus knausi – a careful shopper abundant in riparian habitats.

Onthophagus browni – a careful shopper living with kangaroo rats.

Onthophagus brevifrons – a careful shopper living with woodrats.

Onthophagus velutinus – a careful shopper.



Copris arizonensis – another careful shopper that lives with woodrats.