



A bearded dragon  
hunts a mealworm.

# **Myths about Mealworms** *Clashes over Chitins!*

Mealworms are one of the most extensively-used feeder insects currently available in the UK, and yet they are by far the most vilified. There are more myths, half truths and rumours about mealworms than all other feeder insects put together. Andy Tedder attempts to sort fact from fiction.

## Pseudo-fact 1: mealworms are indigestible

Perhaps the most commonly voiced argument against the use of mealworms, which are the larval form of the meal beetle (*Tenebrio molitor*), relates to perceived difficulties regarding the digestion of these feeder insects. You will see this 'theory' advanced in a variety of situations, including on websites and in the care sheets of well-respected breeders and keepers, along with species-specific books and forums.

The main basis for this argument is generally as follows: "The chitin in the exoskeleton of mealworms is too hard to be digested by most reptiles, and so there is a risk of impaction if they are used." Having read this type of statement in just about every available source relating to reptile husbandry, you would be forgiven for taking it at face value.

Chitin is a tough fibre that is the principle component of the exoskeleton (or body casing) of all insects. Reptiles (and other insectivorous animals) have, however, evolved various methods of digesting chitin, which fall into two major groups:

**1 – Chitinolytic enzymes.** These are specific enzymes, which are targeted to break down chitin. The presence of these enzymes has been demonstrated in the digestive tract of various lizard species, although there is natural variation in their efficiency.

**2 – Beneficial microbes.** These, along with the stomach contents of reptiles, form a very potent digestive cocktail which, although not chitin-specific, does breakdown this material.

OK, so all commercially-available insect feeders (and all insects in general) contain some chitin in their exoskeleton, but do mealworms have a thicker, harder shell with more chitin in? The answer to this, as demonstrated in Table 1, is a conclusive NO. Mealworms have a comparable level of chitin to most other insects commonly used



The paler whitish mealworms in a group are shedding, and so temporarily lack a hard covering of chitin on their bodies.

as livefood, containing potentially less chitin than crickets, which are very widely fed to reptiles and amphibians in general.

If mealworms are digestible however, then why are there apparently so many cases of undigested exoskeletons being excreted by reptiles every year? Well, there are a variety of possible reasons for this, but they all fall under the general category of husbandry. Some of the most common causes are listed below:-

**1 – Incorrect temperature in the vivarium.** Reptiles are exothermic and so require an external source of heat to warm their body, and thus allow them to perform normal bodily functions. Each species will have quite specific temperature requirements, and so it is very important to get this variable correct. If the reptile is not able to achieve its correct body temperature, therefore digestion (along with other processes) will not be carried out efficiently, and thus not all food items will not be fully digested.

**2 – High parasite burden.** In individuals with a large number of intestinal parasites, so digestion can be badly affected. There are likely be other symptoms also, such as weight loss, and so it is very important to get your animals tested as necessary to ensure that they are free from parasites.

**3 – Over-feeding.** The digestive tract of reptiles is a finite size, and so they can only eat a set amount of food at a certain sitting. This does not mean that the animal will stop eating, as there is no evidence to suggest that reptiles feel 'full' as humans do. If you feed your reptile to this level of excess then the digestive system will be overwhelmed, and so poorly digested food is likely to be excreted. Over-feeding will also have other unwanted side effects, such as obesity in the medium to longer term.

It is very important if you find undigested feeder insect exoskeletons in the faeces of your animals to discover why this has happened. Blaming the feeder insect is not the answer; the underlying husbandry issue must be addressed for the long-term health of the animal.

**Table 1. Analysis of selected whole insects (all values are mg/g).**

Component	Adult Cricket	Mealworm Larvae	Mealworm Beetle	Waxworm Larvae
Moisture	682	648	637	585
Crude Protein	225	174	237	161
Fat	59	134	54	243
ADF †	26	23	74	21
NDF †	52	33	115.5	37
Estimate of Chitin *	67.6	55.7	137.2	38.1

† Both ADF and NDF are measures of fibre content. \* Estimate of chitin is based on dry matter (mg/kg). This table is based on: Fink, M (2007) Estimate of Chitin in Raw Whole Insects. *Zoo Biology* 26: 105-115.

**Conclusion: mealworms are indigestible - MYTH**

### Making a judgement

One general word of warning when reading nutritional value tables like this is: check the source thoroughly. If the source is from a peer-reviewed scientific journal, as in this case, then you will be able to assess the methods, and judge for yourself how accurate it is. If no source for the information is provided, then you have no idea whether the information is likely to be accurate.



*“ so it should be clear that mealworms do have a nutritional value, and that these various dietary components will vary in amount but can be easily increased.”*

**Mealworms are useful for taming some reptiles, including bearded dragons.**

### **Pseudo-fact 2: mealworms have no nutritional value.**

As with all the pseudo-facts in this article, this statement is heard far too often, from seemingly reputable sources. The glaring flaw in this statement should be clear to all reptile keepers; every food item HAS nutritional value. In fact, finding a foodstuff which is completely devoid of nutritional value would be impossible. Surprisingly few reptile-keepers actually have any real grasp of the nutritional content and potential benefits of using these insects.

I suspect that this pseudo-fact has arisen from the relatively high fat content of mealworms and indeed, all insect larvae (and it may even be linked to Pseudo-fact 1). However, having a high fat content does not mean mealworms are incapable of providing all the elements required in a reptile's diet.

Exact values for dietary components like protein and fibre will vary with the type of livefood, and as Table 1 shows, there are clear differences between both the various species, and the stage in their lifecycle. However, ALL species have these compounds in their bodies.

In cases like this however, my suspicion is that people are referring not to proteins for example, but more likely to trace elements or vitamins in a given feeder insect. As I

have already mentioned, these along with proteins, fibre and other compounds which make up the insect's body, will vary with species.

Reliable information on these compounds (with the exception of calcium and phosphorus) is much more difficult to find. This, however, is less of a problem than you may first think. As we all know, correct gut loading and supplementation of all feeder insects is very important, and using this type of food will ultimately provide trace elements that it would be impossible for the animal to get anywhere else.

It is very important to remember to gut-load all insects 24-48 hours before using them as food. This timing is really important,

as further trace elements and other 'nutrients' consumed by the feeder insect are only present in the gut lining, and will be passed out of the body after this time.

OK, so it should be clear that mealworms do have a nutritional value, and that these various dietary components will vary in amount but can be easily increased. It is therefore up to you as a reptile owner to make sure that you regulate the intake of certain compounds, especially fat. For me, I find that as a vessel for gut-loading and supplementing, mealworms work quite well. However, I am also always very careful not to allow my animals to become overweight.

**Conclusion: mealworms have no nutritional value - MYTH**



**Bearded dragon crunches up a mealworm in its jaws before swallowing it, aiding the digestive process.**

The mealworm's strong mouthparts can be seen here.



### **Pseudo-fact 3: mealworms will eat their way out of your animals' stomach.**

This is one of my personal favourites, and is generally suggested in the following fashion: "A friend of a friend's cousin('s brother's wife's uncle...) had a leopard gecko and one day a mealworm ate its way out of its stomach."

I suspect we have all heard this story at some point, and if you have not heard it, you should certainly look forward to it in the future. If we hear this story so frequently, then perhaps there is some truth to it? Well, mealworms, like all insects, have strong jaws, thanks in part to the high percentage of chitin present in their skeleton. This certainly gives them the ability to bite.

I believe this is a fact that not many would dispute; however, the key to this debate is whether or not we consider the chances of a mealworm (or really any feeder insect) surviving firstly being eaten, and then secondly, the very inhospitable environment within a reptile's stomach. For me, the chances of this being the case exceed 'highly unlikely' and therefore rest firmly in the 'impossible' camp.

So, if this is the case, then why do people claim to find animals that appear to have

been eaten through by mealworms? This is not something that I will deny the existence of, but I would definitely question the chain of events. Mealworms will eat almost everything, and if an animal stays still for long enough, then they will indeed try to eat it. I think this is a pivotal point, because for an animal to stay still long enough for an insect to begin to eating it, then that the animal is either already dead itself, or in the process of dying.

Unfortunately when people lose an animal in unforeseen circumstances, they often look for a reason as to why it died (as of course you should) but we have to be able to separate the chain of events into their true order. Mealworms eating out of the stomach is far, far less likely than mealworms eating into the abdomen of a deceased reptile.

**Conclusion: mealworms will eat their way out of your animals' stomach - MYTH**

### **In summary**

I'm sure there are many other gruesome and horrifying tales about the perils of using mealworms as part of your reptile's diet, but many of them, like the

three examples above, are unlikely to be based on hard scientific fact.

This article is not intended to suggest that mealworms should be used as a staple diet for your reptile, nor is it meant to encourage you to feed them if you currently choose not to do so. Its purpose is simply to suggest that there are many myths about mealworms that are simply unfounded, and they actually make keeping insectivorous reptiles more difficult than it needs to be.

Mealworms have several positive attributes that ensure they are useful as a feeder species, including the simplicity of gut loading and supplementing them, as well as the ease of breeding them. They do also have several negative attributes though, including their relatively high fat content, and so in no way do they represent a complete, balanced diet. As with any foodstuff, I recommend you should exercise your judgement into terms of how many and how often mealworms should be fed to your animals. ■

**Many professional leopard gecko breeders rely heavily on mealworms as livefood.**

