Chapter Six

Shafan – The Hyrax

The Identity of the *Shafan*

The popular – and as we shall see, the correct – understanding of the *shafan* is that it refers to the hyrax.[1] These are also called dassies, rock badgers, rock rabbits, or klipdas. Hyraxes (the plural form is sometimes written as "hyrax" or "hyraces") are small mammals that somewhat resemble large guinea pigs. Adults measure around twenty inches in length and weigh six to ten pounds. According to mainstream zoological taxonomy, hyraxes are classified as being most closely related to elephants (!) and are in the category of "subungulates," meaning that they are almost ungulates (hoofed mammals), but not quite. The species found in Israel is *Procavia capensis* (sometimes called *Procavia syriaca*), known in Modern Hebrew as *shafan sela* and in English as the rock hyrax.

[1] Note that the term "coney," which is used in some works as a translation of *shafan* or *arneves*, usually refers to the rabbit, and was originally used by European and American translators who were unfamiliar with the hyrax. Since then, the word has sometimes also been used to refer to the hyrax.

Rock hyrax

Traditional sources for identifying the *shafan* as the hyrax include Rav Saadia Gaon (882-942 CE), Ibn Janach[1] and *Tevuos Ha-Aretz*. These authorities translate *shafan* as *wabr*, which is the most common and widespread Arabic name for the hyrax.[2]

The Septuagint translates *shafan* as *coirogrullion*, which is a difficult word to translate. There is a report that this is to be identified with the jerboa, a type of jumping rodent.[3] However, as we shall discuss at the end of this chapter, this is not an acceptable identification for the *shafan*, since it does not match the description of the *shafan* being a non-rodentlike creature that hides under rocks. According to Gesenius, *coirogrullion* means "bristly animal" or "hairy animal."[4] Some have understood this to refer to the hedgehog. Yet this cannot be correct, as hedgehogs do not live in rocks and do not do anything that could be described as bringing up the cud. But Gesenius explains that this name refers to the hyrax, and states that the Arabic

[1] Rabbeinu Yonah Ibn Janach, *Sefer HaShorashim* (Berlin 1896), *shafan*.

[2] H. B. Tristram, *The Natural History of the Bible* (New Jersey: Gorgias Press 2002, reprint of 1883 ed.), p. 75.

[3] From a Coptic-Arab dictionary cited by Ernst Friedrich Rosenmüller, *Handbuch der Biblischen Alterthumskunde* (Leipzig: Baumgärtner 1823-1831) vol 4 part II p. 214.

[4] Wilhelm Gesenius, *A Hebrew & Chaldean Lexicon to the Old Testament* (London: Willams & Norgate 1867, translation by Samuel Davidson) p. 1432.

name *wabr* conveys the same meaning, due to its "rough skin and bristles." This may refer to the long hairs that emerge at intervals all over its body, which the hyrax uses like whiskers to feel its way in dark tunnels.[1]

In the fifth century, Hieronymus explained *coirogrullion* to refer to a creature that is no larger than a hedgehog, and resembling both a bear and a mouse; he notes that it is therefore also called *arktomys*, which literally means "bear mouse."[2] He describes it as being very common in Israel and living in caves in the rocks. Today, *arktomys* is the Latin name for the marmot (known in America as the wood-chuck or groundhog), but these are not native to the region of Israel, and they live in tunnels rather than rocks. It is therefore clear that Hieronymus was referring to the hyrax. Various others who studied the animals of the Bible, such as the eighteenth-century explorer James Bruce,[3] and the nineteenth-century German Hebraist Ernst Friedrich Rosenmüller,[4] also concluded that the *shafan* is the hyrax.

Malbim (Rabbi Meir Leibush, 1809-1879) also explains that *shafan* refers to the hyrax, and gives reasons for this that we shall see later. So, too, is the conclusion of Rabbi Dovid Tzvi Hoffman (1843-1921).[5] The Israeli zoologists, Professor Shimon Bodenheimer,[6] Dr. Menachem Dor,[7] and Dr. Yehudah Feliks,[8] who carefully studied the

[1] Rosenmüller (op. cit. p. 220) likewise states that the hyrax earns its Amharic name of *aschkoko* due to its possessing hedgehog-like hairs that resemble thorns, called *aschok* in Amharic.

[2] *Letter to Sunnias and Fretela* (403 CE). Cited by Rosenmüller and Rabbi Dovid Tzvi Hoffman.

[3] James Bruce, *Travels to Discover the Source of the Nile* (1790) vol. 5.

[4] Ernst Friedrich Rosenmüller, *Handbuch der Biblischen Alterthumskunde* (Leipzig: Baumgärtner 1823-1831) vol 4 part II pp. 213-222.

[5] Commentary to Leviticus 11:5, p. 228.

[6] Prof. Shimon Bodenheimer, *HaChai B'Eretz Yisrael* (Tel Aviv: Dvir 1953) p. 245.

[7] Dr. Menachem Dor, *HaChai BiMai HaMikra HaMishnah VeHaTalmud* (Tel-Aviv: Grafor-Daftal books 1997), p. 56.

[8] Prof. Yehudah Feliks, *The Animal World of the Bible* (Tel-Aviv: Sinai 1962) p. 45.

zoology of the Torah, all concluded that the *shafan* is the hyrax. This is also the preferred conclusion of the contemporary Torah scholars who have published works specializing in animals of the Torah, Rabbi Yisrael Meir Levinger[1] and Rabbi Amitai ben-David[2] – and, of course, this author. As we shall see, only those who were unfamiliar with the hyrax thought that the *shafan* is a different animal such as the rabbit or jerboa.

Evidence for the Hyrax

There are several different lines of evidence demonstrating that *shafan* refers to the hyrax. First, there are some verses in Scripture which match the hyrax perfectly:

שְׁפַנִּים עַם לֹא עָצוּם וַיָּשִׂימוּ בַסֶּלַע בֵּיתָם:
ספר משלי פרק ל פסוק כו

> The *shefanim* are not a strong people, but they place their home in the rock.
>
> Proverbs 30:26

Being relatively small animals, hyraxes are preyed upon by eagles, jackals, hyenas and snakes. They are indeed not a strong people.

The verse further states that they place their homes in the rocks (the name *shafan* is explained by some to mean "hidden one"). A similar description is given elsewhere:

הָרִים הַגְּבֹהִים לַיְעֵלִים סְלָעִים מַחְסֶה לַשְּׁפַנִּים:
ספר תהילים פרק קד פסוק יח

> The high hills are for the ibex, the rocks are a refuge (*machseh*) for the *shefanim*.
>
> Psalms 104:18

[1] Rabbi Yisrael Meir Levinger, *Maor LeMaseches Chullin* (Jerusalem: Maskil LeDavid 1995) p. 4.

[2] Rabbi Amitai Ben David, *Sichas Chullin* (Jerusalem: Medrash Bikkurei Yosef 1995) p. 410.

מחסה – כל לשון מחסה לשון צל ומחבא שאדם מתכסה שם מן הזרם ומן המטר אבר"י בלע"ז:

רש"י שם

> *Machseh* – Every form of the word *machseh* is a term of shade and hiding place, where a person hides from the storms and rain, *abriement* in Old French.
>
> Rashi ad loc.

There are different species of hyrax, but the species found in Israel always lives in rocky areas (and hence is called the "rock hyrax"). They have a multitude of tunnels and hiding places in these rocks, and when danger threatens, they all dart into hiding:

> The habits of the coney (hyrax – N.S.) are very accurately portrayed in the Psalms and in Proverbs. It does not, like a rabbit, scoop out a burrow for itself, but lives in holes in the rocks, where it makes its nest and conceals its young, and to which it retires at the least alarm.
>
> H.B. Tristram, *The Natural History of the Bible* (New Jersey: Gorgias Press 2002, reprint of 1883 ed.) p. 76

> …wherever there are rocky cliffs, outcrops of boulder screes providing cavities in which the colonies can find shelter, one can reasonably expect to find hyrax… Rock hyraces do not burrow but inhabit any type of rock providing suitable cavities as dwelling holes.
>
> J. B. Sale, "The habitat of the rock hyrax," *Journal of the East African Natural History Society* (1966) 25 pp. 205-214

These refuges serve to protect the hyrax from predators, including leopards, hyenas, but principally eagles.[1] Verreaux's eagle (*Aquila verreauxii*) is the major predator of hyraxes, feeding upon them almost exclusively.[2] This predation by birds is highlighted in the Midrash:

[1] H. Hoeck, "Hyraxes," in *The Encyclopedia of Mammals* (Ed. D. MacDonald, Oxfordshire: Andromeda Oxford 2001).

[2] V. Gargett, *The Black Eagle: A Study* (Randburg, South Africa: Acorn Books, 1990).

"סלעים מחסה לשפנים" הדין טפזא מיגין תחות שקפה מפני העוף בשעה שהוא פורח שלא יאכלנו...

מדרש רבה בראשית פרשה יב פסקה ט

"The rocks are a refuge for hyraxes" – These hyraxes hide under clefts from birds flying overhead, that they should not eat them…

Midrash Bereishis Rabbah 12:9

A hyrax hiding in the rocks of Ein Gedi in Israel

In the aforementioned verse, the *shafanim* are described immediately after the ibex (a species of wild goat). This may suggest geographical proximity, and indeed both ibexes and hyraxes are noticeably abundant in the hills surrounding the Dead Sea, especially in the region of Ein Gedi.

In the Ehkili dialect of Arabic (Sabean) the hyrax is called *thufun*, from the root *thafan*, which is related to the Hebrew word *shafan*.[1] As Ibn Ezra states, Arabic names provide strong evidence for an animal's Torah identity.[2]

As we saw in chapter two, several opinions explain that the Torah specifically wanted to warn against eating those non-kosher animals that were commonly eaten by people in the area. Hyraxes are indeed a popular food item:

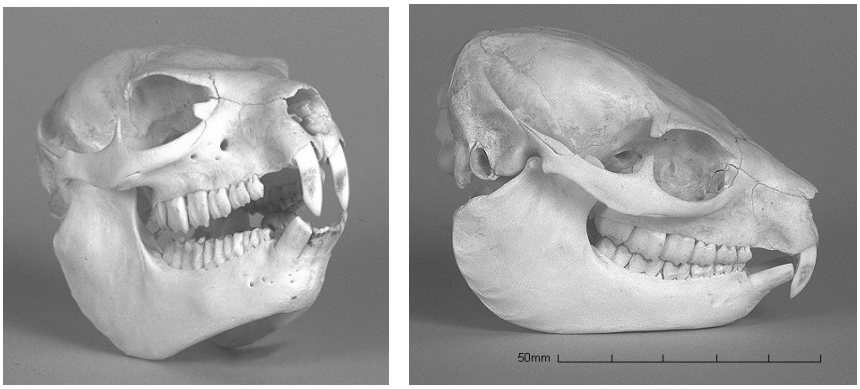
[1] Fulgence Fresnel, *Journal Asiatique*, 3rd series, v. 514, cited in *The Jewish Encyclopedia* (New York and London: Funk & Wagnalls Company 1901), "Coney"; H. B. Tristram, *The Natural History of the Bible*, loc. cit.

[2] Commentary to Leviticus 11:13.

> The flesh is much prized by the Arabs.
>
> H.B. Tristram, *The Natural History of the Bible*
> (New Jersey: Gorgias Press 2002, reprint of 1883 ed.) p. 77

Some present another reason for identifying *shafan* as hyrax. Historians say that 3000 years ago, Phoenician sailors explored the Mediterranean, sailing westward from their homeland on the coast of Syria. They found land where they saw many animals which, according to the literature, they thought were hyraxes (but which subsequently turned out to be rabbits), and so they called the place Ishaphan, Island of the Hyrax. The Romans later modified the name to Hispania, and we now know it as Spain.[1] However, even if true, this only shows that the Phoenicians considered rabbits to resemble *shafanim*; it does not necessarily mean that the *shafan* is the hyrax.

Finally, the Talmud (*Chullin* 59a) states that, unlike most ruminants, the *arneves* and *shafan* possess upper teeth. This matches the hyrax, which possess large upper incisors.



Two views of a hyrax skull

Hooves of the Hyrax

Hyraxes do not have hooves in the commonly used sense of the term. However, their feet are of a peculiarly solid shape with a

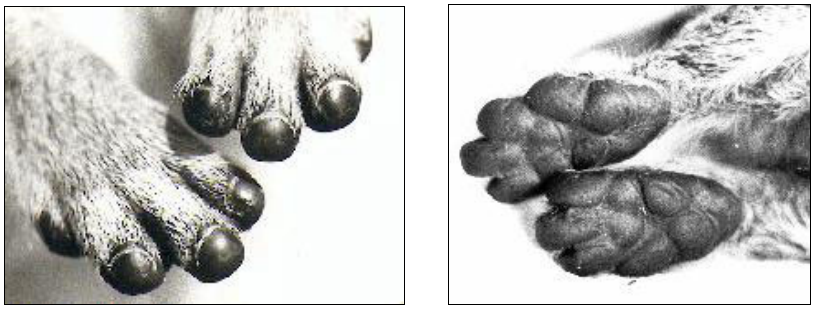
[1] H. Hoeck, "Hyraxes," in *The Encyclopedia of Mammals* (Ed. D. MacDonald, Oxfordshire: Andromeda Oxford 2001).

rubbery texture. The front foot has four toes that are little more than stubby outgrowths of the foot, while the hind feet possess three longer toes that are joined for much of their length but are still far more divided than those of the front feet. At the end of the toes are thick nails, concerning which one reference work states:

> These are not nails, but rather true hooves.
>
> H. Hoeck, in *Grzimek's Encyclopedia of Mammals*
> (New York: McGraw-Hill Publishing Company 1990), vol. 4 p. 541

According to some commentaries, the Torah is saying that the hyrax does not possess split feet, while according to others, it is saying that it does not possess hooves at all. Since the hyrax's nails do not encase the foot, it is not rated as a hoof in the Torah sense of the term (similar to the camel). *Midrash Lekach Tov* states that the *shafan* possesses paws, which would adequately describe a hyrax.

Malbim sees the foot structure of the hyrax as being perfectly described in the words of the verse: "*ufarsah lo yafris*" (Leviticus 11:5), which is written in the future tense. The precise meaning of this phrase (as contrasted with that describing the camel and the hare) is that it does not finish developing cloven hooves on its front feet, even though it looks as though it has started developing them on its hind feet.[1]



Front and bottom view of the forefeet of a hyrax

[1] Malbim, who had almost certainly never actually seen a hyrax, apparently thought that the hyrax has a fully split hind foot.

Bottom view of the hindfoot of a hyrax

Does the Hyrax Chew its Cud?

Although, as we shall later discuss in detail, hyraxes possess unusual digestive systems, there is no chamber producing "cud" to be chewed. This in itself does not rule out the possibility of the food being simply regurgitated anyway. But based on observations of their behavior, it seems that this does not happen. Zoological texts therefore state that the hyrax is not a ruminant. The source usually cited for this information is Dr. Hendrik Hoeck. Dr. Hoeck performed field research on the behavioral ecology of hyraxes at the Serengeti Research Institute in Tanzania. He is the author of several papers about hyraxes, and is widely considered as an expert in this family of animals. He writes:

> Hyraxes do not ruminate. However, their gut is complex, comprising three separate areas of microbial digestion, and their ability to digest fiber efficiently is similar to that of ruminants.
>
> H. Hoeck, "Hyraxes," in *The Encyclopedia of Mammals* (Ed. D. MacDonald, Oxfordshire: Andromeda Oxford 2001) p. 449

But a contrasting view is presented in a study of hyraxes by Dr. Aharon Meltzer and Michah Levnah, although these authors note that it is of doubtful credibility:

> An interesting piece of information has been presented by one researcher, that hyraxes in captivity, which are fed on dried grasses, chew the cud for about half an hour daily. The hyrax is

> also rated as chewing the cud in the Bible. However, other researchers place doubts on the authenticity of this observation.
>
> *Shafan HaSela'im* (Israel: Massada 1982) p. 60

The researcher referred to is the zoologist Dr. Hubert Hendrichs, who also cites the 18th century traveler James Bruce. Hendrichs reports as follows:

> In the summer of 1962 I observed duikers over 24-hour periods in the Round House at the Frankfurt zoo. I simultaneously observed eight hyrax that had arrived from Eritrea, and saw them at night, in a resting position, several hours after their last food intake, chewing for a considerable time. However with the bad light and the distance to the closely crouching animals I could not recognize details. In the Hellabrunn Tierpark, Munich, I could more precisely observe 3 hyraxes (*Procavia capensis*…). Due to two fortunate circumstances I am able to state that they actually ruminated:
>
> 1. During the quiet winter months (1962/63) the animals were so trusting that they ruminated even during the day.
>
> 2. One of the animals, "Grey," frequently used a place for rumination that was directly at the window which separates it from the observer. Therefore I could often precisely observe it from a distance of only 1 meter and saw a sequence of dozing, eructations, taking the ruminating position, regurgitating a bolus, chewing, intermediate swallowing, and final swallowing. Once I could clearly also observe with "Brown" the sequence of regurgitation, chewing, and swallowing.
>
> Since with these two animals I clearly determined re-chewing, this was probably also the case with the animals in Frankfurt, although in the spring of 1963 I was not able to clearly follow the sequence of regurgitation, chewing, and swallowing with them. I repeatedly saw eructations and swallowing as a conclusion of chewing, accompanied by convulsions.
>
> …The Jewish legislators (Leviticus 11:5) already knew that the hyrax chews the cud. They placed it with the impure animals, "because it chews the cud, but has no split hooves." Bruce, who

> toured the Nile countries from 1768 to 1773, writes from Aschkoko about the hyrax: "I never heard a sound from it, but it reliably ruminates; in order to examine this I kept it alive for some time."[1]
>
> H. Hendrichs, *Vergleichende Untersuchung des wiederkau-verhaltens* [Comparative investigation of cud retainers], *Biologisches Zentralblatt* (1965) 84:6 pp. 736-739 (translated from German)

According to Hendrichs' report, the reason why the hyrax's cud chewing behavior remained unconfirmed for so long is that the animal chews cud for only only 20 to 50 minutes per day and usually at night. However, as noted above, others doubt the accuracy of the observations and deductions of Hendrichs and Bruce:

> Throughout my observations of rock hyraces I have found no evidence of rumination… Hyrax will sometimes produce a chewing motion without having recently ingested… this motion reminds one forcibly of a ruminant and is probably responsible for the statement by some observers that hyrax chews the cud (Bruce, 1790)… Hendrichs (1963) claims to have observed rumination in *P. capensis* in captivity in Europe. He informs me that the animals chewed the cud for ½ hr (in 24 hr) when fed on dried grass (? hay). Until more details of these observations are available it is unwise to comment but my own view is that although hyrax sometimes chew in the absence of ingestion, they do not regurgitate material from the stomach for further mastication. The simple structure of the stomach would appear to make such action extremely unlikely. Should rumination be established, the accuracy of the Bible (Lev. XI, 5), where the coney is stated to chew the cud, will be attested.
>
> J. B. Sale, "Daily food consumption and mode of ingestion in the hyrax," *Journal of the East African Natural History Society* (1966) 25 pp. 215-224

Dr. Hendrik Hoeck, author of the statement in *The Encyclopedia of Mammals* that hyraxes do not ruminate, likewise claims that Hendrich's conclusion was mistaken:

[1] James Bruce, *Travels to Discover the Source of the Nile* (1790) vol. 5.

> I have been asked several times the question if hyrax chew the cud. I know that it is mentioned in the Bible and Dr. Hubert Hendrichs is the last scientist to report it.
>
> For the past 30 years I have been observing hyrax and I never saw this behavior in the field. However, when an animal shows antagonistic behavior (threatens and/or is afraid) it will make chewing movements,[1] which could be interpreted as chewing the cud. Dr. Hendrichs made his observation while the animal was in captivity in a cage. Therefore I'm pretty sure that the animal he observed was showing antagonistic behavior towards him. Maybe the observations in the Bible were also made in captive animals.
>
> Many years ago I exchanged this information with Aharon Meltzer (co-author of *Shafan HaSela'im*) and we both were in agreement.
>
> …I observed on a few occasions in resting rock hyrax that they will make chewing movements (3-4). Sometimes I heard this also during the night, when resting animals were huddling. Maybe it is a form of social communication? I had a habituated animal and by having a close look I could not see any indication that she was chewing a cud.
>
> H. Hoeck, personal communication 2002

The matter has not been fully resolved. Some might wish to rely on Dr. Hendrichs (and on the simple reading of the Torah) that hyraxes do indeed regurgitate their food and chew it again. Others will prefer to rely on the research of Dr. Sale and Dr. Hoeck, especially since Hendrich's reports of rumination in other animals has likewise been challenged.[2]

There is another possibility. There is a phenomenon called "merycism" that we shall later discuss in detail. It is a limited variation of rumination which is found in Australian marsupials such as koalas and kangaroos. With merycism, the animal regurgitates a

[1] This is also reported by Dr. Aharon Melzer in *Shafan HaSela'im* (Israel: Masada 1982). More sources for this will be cited later.

[2] Hendrich's report on kangaroos as ruminants has been strongly challenged, as we shall see later.

small amount of food, and it is not chewed as thoroughly as is the case with ruminants, nor does it play as fundamental a role in digestion. Still, it may well qualify for the label of *ma'aleh gerah*. It could be that the observations of chewing motions in the hyrax are due to merycism.[1]

In response to the question of whether merycism might occur with the hyrax, Professor Ian Hume, author of several papers on hyrax physiology, makes a startling suggestion:

> I wouldn't be surprised if merycism was widespread amongst mammals, including humans. It seems to be an effective way of increasing salivary flow for buffering acid and/or increasing starch digestion.
>
> I. Hume, personal communication 2003

It should be noted that there are likely to be different degrees of merycism. The merycism that takes place with the koala (to be later discussed) is far more significant than that which is an aberrant behavior with certain humans. In response to a paper about merycism in koalas, Dr. Hoeck admitted that this might also take place with hyraxes:

> I cannot exclude that similar behavior could occur in hyrax. It needs to be investigated very carefully...
>
> H. Hoeck, personal communication 2003

Professor Christine Janis, who specializes in the relationship of craniodental morphology to diet in ungulates, and is the author of a paper on hyraxes that we shall later cite, writes:

> …when I kept pet hyraces I would occasionally (maybe up to two or three times per week) see them doing some brief chewing movements... It's not regular rumination, as in a true ruminant, but it may be that they regurgitate and rechew a little bit of food.
>
> C. Janis, personal communication 2003

[1] The relatively high acidity of the hyrax's stomach would not necessarily present a difficulty with this. As we shall see later, it is suggested that since meryvism involves the regurgitation of only a small amounts, the acidity can be neutralized by saliva.

Thus, although there is no firm evidence for it, there is a possibility that the hyrax practices merycism, and is therefore described as bringing up the cud. It should be noted, however, that if this is the case, then there are several other animals which likewise possess one kosher sign. We shall discuss merycism and marsupials in greater detail in a separate chapter.

Does the Hyrax *Not* Chew its Cud?

As far as most people know, the hyrax does not chew its cud. It is on these grounds that some atheists state that the Bible contains blatant errors. But even from their perspective, the Bible must have had *something* in mind when describing the hyrax as bringing up its cud. Furthermore, the description of the *shafan* (and *arneves*) as bringing up the cud was something that was universally accepted until the nineteenth century and was never before used as an argument against the Torah's authenticity.

It follows that there must be some grounds for thinking that the hyrax brings up its cud. Aside from the possibility mentioned above that the hyrax genuinely regurgitates its food, we have also noted that the manner in which the hyrax chews is claimed to be the cause for people thinking that the hyrax brings up its cud; others attribute the Torah's description to certain structural aspects of its digestive system. We need to explore these features of the hyrax in detail, and discuss the possibility that such features may in fact *justifiably* provide grounds for the hyrax to receive the label of *ma'aleh gerah*.

Some, however, go much further with the idea of the broad acceptance of the Torah showing that the description of the *shafan* is not baseless. They argue that the ancients were very familiar with the animals concerned; hence, they would not have accepted the Torah's statement that the *shafan* brings up its cud unless such is actually the case. They claim that the Torah could not have been accepted with a blatant mistake. Thus, since the Torah was accepted, and the hyrax does not chew the cud, then the *shafan* cannot be the hyrax.

Aside from the arguments that we have presented as to why it is difficult to accept that the *shafan* (and *arneves*) are unknown or extinct animals, this argument is entirely baseless for one who does not *a priori* accept the divine authorship of the Torah. There was no systemized study of zoology in earlier times, and there was no *Encyclopedia Britannica* or *National Geographic*. Consequently, there were innumerable prevalent misconceptions about the animal kingdom, even concerning animals with which people were familiar. People used to think that certain geese grew from trees, that ducks spent the winter hibernating at the bottom of ponds, that insects spontaneously generate, that touching toads causes warts, and that tarantulas are deadly. The disbeliever will quite reasonably state that people might well have mistakenly assumed that the hyrax brings up the cud, since it chews like a ruminant.

The correct application of the point that the Torah's description cannot be entirely groundless is that there must be something about this animal which could lead someone to think that it brings up the cud, and then to explore whether these features might actually genuinely earn the appellation of *ma'aleh gerah*, which was perhaps not intended to mean that the hyrax actually brings up the cud.

Loose and Inaccurate Translations

Before looking at specific aspects of the hyrax, let us first deal with a more basic question. How legitimate is it to explain that *ma'aleh gerah* is to be translated loosely to refer to anatomical features or jaw-movements? It has to be noted that this is not merely a "loose" translation, but rather one that is totally different from the literal translation. Can Orthodox Jews do this with the words of the Torah? And can it be defended as a reasonable interpretation to those who do not accept the Divine authorship of the Torah?

The answer is yes. Although there is a principle in the Talmud of *ain mikra yotse midei peshuto*, "a verse does not depart from its literal

meaning," this is not a blanket principle.[1] Scripture is full of euphemisms, metaphors, and idioms. For example, the phrase "raising up one's voice" is used idiomatically to refer to giving forth voice,[2] the phrase "lifting up his head" is used metaphorically to mean "restoring his honor,"[3] and the phrase "drying the bones" is used idiomatically to refer to sapping strength.[4] There is clear precedent for taking phrases as idioms.

Likewise, it is legitimate to propose that the phrase *ma'aleh gerah* can refer to any type of ruminant-like behavior, even if the words themselves do not literally refer to such phenomena. This is not as far-fetched as it might sound. A similar phenomenon exists in zoology; pandas and sun bears are classified as Carnivores even though they are not carnivores. That is to say, even though they are not carnivorous, they are nevertheless classified as being part of the order Carnivora (which is Latin for "meat-eater), due to various affinities that they share with true carnivores. Just as a panda is called a Carnivore even though it is not a carnivore, a hyrax can be called a Cud-chewer even though it is not a cud-chewer, if we see that it shares some fundamental similarities with ruminants.

It should also be noted that it is obvious that the term *ma'aleh gerah* is not to be taken *absolutely* literally. After all, the act of vomiting is, quite literally, an act of *ma'aleh gerah*, and yet it is clear that the term is not intended to include the many thousands of species of animal that vomit!

[1] Although the Talmud in *Yevamos* 24a states that there is only a single exception to this, it is clear from other sources (such as *Tosafos* to *Yevamos* 11b) that this means that there is only one instance where a verse is taken out of its literal meaning for no innate reason. See Rav Saadia Gaon, *Emunos V'Deyos* 7:1, regarding when it is legitimate to divert from a literal understanding of Torah.

[2] Genesis 27:38.

[3] Genesis 40:13.

[4] Proverbs 17:22.

We are not proposing that such explanations are entirely straightforward. It is different from other idioms and metaphors in the Torah, since in this case the phrase is apparently used quite literally in the accompanying verse regarding the camel. We would probably have to posit that, even with the camel, it is being used as an idiom rather than an adjective. Still, it is legitimate.

The Guts of the Hyrax

Let us now look at whether the digestive system of the hyrax provides grounds for rating it as fundamentally similar to a ruminant. The digestive system of the hyrax is highly unusual. The gut is complex, and they possess an ability to digest fiber efficiently, similar to that of ruminants. Hyraxes possess three separate areas of fermentation in their gut: the forestomach, a distinct proximal cecum, and a pair of horn-shaped areas that are referred to as ceca or colonic appendages.

> The pair of ceca found in the hyrax is almost unique for mammals. Among the Mammalia the double ceca is found only in the hyrax and a few species of Edentate… The role that the ceca play in the hyrax seems limited; however, quantities of ingesta (fluid and particulate matter) are retained in them and microbial fermentation of the ingested material appears to take place at this site.
>
> E. T. Clemens, "Sites of organic acid production and patterns of digesta movement in the gastrointestinal tract of the rock hyrax," *Journal of Nutrition* (1977) 107:11 pp. 1954-61

> The (paired colonic appendages) serve to increase both gut volume and absorptive surface area. Their morphology (blind appendages) provides a habitat for fermentative bacteria and slows down rate of digesta passage, and thus enhances fermentative digestion.
>
> I.D. Hume, personal communication 2003

Some books even describe the guts of the hyrax in a way that shows why it might indeed be considered to possess the multiple stomachs of a ruminant:

> The presence of the midgut sacculation (cecum – N.S.) appears to be the most unusual feature of the digestive tract… This digestive organ appears analogous to a misplaced rumen.
>
> E. T. Clemens, loc. cit.

According to Professor Yehudah Feliks,[1] cited approvingly by certain Torah scholars,[2] this somewhat ruminant-like gut (perhaps together with its chewing movements, discussed in the following section) can be described by the term *ma'aleh gerah*.

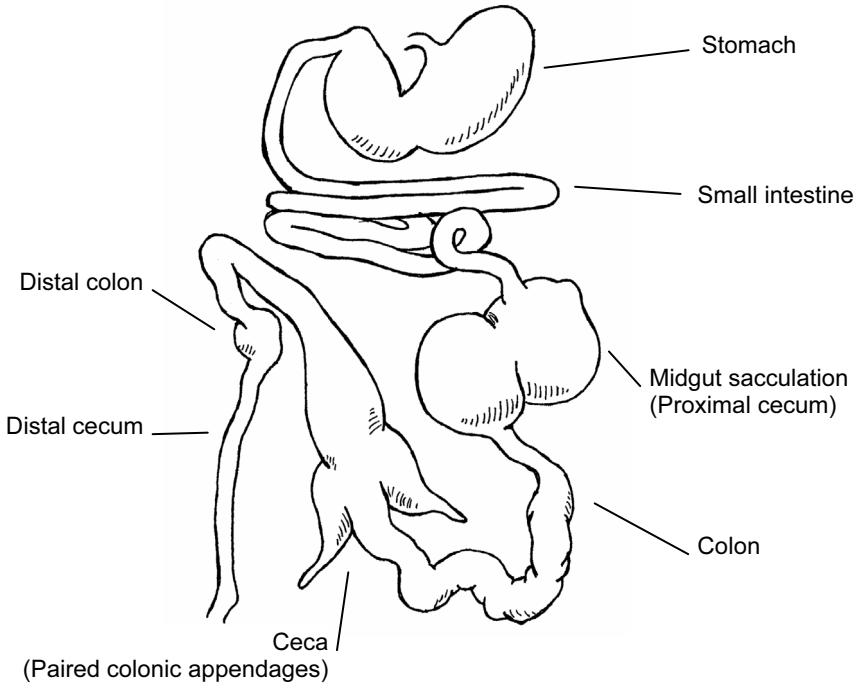


Diagram of hyrax digestive system (after J. R. Paul-Murphy, C. J. Murphy et al., "Comparison of transit time of digesta and digestive efficiency of the rock hyrax, the Barbados sheep and the domestic rabbit," *Comparative Biochemistry and Physiology A* (1982) 72:3 pp. 611-613)

[1] Y. Feliks, *The Animal World of the Bible* (Tel-Aviv: Sinai, 1962), p. 45.

[2] *Torah Sheleimah*, Vayikra 11:31; *Sichas Chullin* to *Chullin* 59a.

The complex stomach structure also results in other similarities with ruminants:

> The transit time of ingesta through the gastrointestinal tract of the rock hyrax was much longer than that of the rabbit and corresponds more closely to the time found in ruminants… The anatomy of the gastro-intestinal tract of the rock hyrax is unique among mammals studied to date. The extended transit time and the ability to efficiently digest fiber are qualities that support analogies to the ruminant.
>
> J. R. Paul-Murphy, C. J. Murphy et al., "Comparison of transit time of digesta and digestive efficiency of the rock hyrax, the Barbados sheep and the domestic rabbit," *Comparative Biochemistry and Physiology A* (1982) 72:3 pp. 611-613

Thus, there are fundamental similarities of the hyrax with ruminants, which would provide grounds for stating that it can be idiomatically described as *ma'aleh gerah*. However, as noted above, such explanations are not straightforward, especially since the Torah uses the same phrase in an apparently literal sense in the preceding verse to describe the camel.

It should also be noted that defining *ma'aleh gerah* in terms of a complex gut might admit a host of other animals into this category. The hippopotamus, kangaroo, babirusa, and peccary all possess a complex gut. Sloths and colobine monkeys also possess complex multi-compartmented ruminant-like stomachs. The Cuban hutia, a large (30-50cm long, 7-9 kg in weight) rodent, has two constrictions in its stomach which divide it into three compartments. We shall later investigate some of these cases in detail, but it should be noted that according to this definition of *ma'aleh gerah*, it does seem that there are other animals which possess only one kosher sign. This would contradict the Talmud's statement; we shall explore possible solutions for this difficulty in a later chapter.

The Jaws of the Hyrax

Another possibility is that the lateral, gyratory chewing movements of the hyrax's jaws, performed at times when it is not eating, resemble those of a cud-chewer, and it is on this basis that it is called *ma'aleh gerah*.[1] Hyraxes do indeed move their mouths in this way:

> Ingested food material is rapidly chewed in a side-to-side manner before swallowing.
>
> J. B. Sale, "Daily food consumption and mode of ingestion in the hyrax," *Journal of the East African Natural History Society* (1966) 25 pp. 215-224

It is no mere coincidence or minor point that ruminant animals all chew in this way. Rather, it is fundamental to their digestion. In order to digest the cellulose from which vegetation is formed, ruminants must thoroughly break it down with a sweeping grinding movement, powered by the strong masseter (muscle) in their jaw.

The skull of a hyrax and its musculature is actually very similar to that of ruminants:

> The skull of hyraces is distinguished from that of other mammals of similar body size by the presence of a complete (or nearly complete) postorbital bar and the relatively large cranial capacity, and the jaws are distinguished by the extreme deepening and posterior extension of the angle of the mandible. These features are shared with recent ungulates, and are presumably correlated with… the adoption of a herbivorous diet, which is in turn correlated with a change in the nature and the amount of mastication, resulting in the hypertrophy of the masseteric musculature.
>
> C. M. Janis, "Muscles of the masticatory apparatus in two genera of hyraces (Procavia and Heterohyrax)," *Journal of Morphology* (1983) 176 pp. 61-87

[1] Rabbi Dovid Tzvi Hoffman, Commentary to Leviticus 11:5, p. 228, in reference to the hare/*arneves* but also appliable to the hyrax; also cited by Rabbi Yechiel Yaakov Weinberg, *Seridei Aish* (vol. II, 17), *Torah Sheleimah* to Vayikra 11:32, and *Sichas Chullin* to *Chullin* 59a. An early reference to this is in H.B. Tristram, *The Natural History of the Bible* (New Jersey: Gorgias Press 2002, reprint of 1883 ed.), p. 76.

Actually, in this regard, it seems that hyraxes are even more thorough than ruminants, precisely because they do not ruminate:

> The similarity in the dentition, and in the size and complexity of the superficial masseter in hyraces and perissodactyls (horses and similar mammals – N.S) may represent a parallel response to the necessity for thorough mastication of large quantities of fibrous food on its initial ingestion.
>
> In contrast, ruminant artiodactyls masticate their food relatively poorly on its initial ingestion, and by the time they remasticate it (in the course of chewing the cud), it has been greatly softened by the process of fermentation, and hence does not require so much effort for trituration.
>
> C. M. Janis, loc. cit.

Furthermore, like ruminants, hyraxes chew when they are not grazing, although this does not seem to be associated with a digestive process.

> All the species (of hyrax) habitually work their jaws in a manner reminiscent of cud-chewing.
>
> *Walker's Mammal of the World* (Baltimore: Johns Hopkins University Press 1997) 5th ed.
>
> Hyrax will sometimes produce a chewing motion without having recently ingested and such action is particularly common when they are confronted by something which is strange to them. It has been observed, for example, when captive animals are introduced to an unfamiliar animal species such as a caged bird. Newly-captured and nervous animals frequently show it when being observed by humans.
>
> J. B. Sale, loc. cit.

There are two ways of explaining how this could be a reason as to why the hyrax is described as *ma'aleh gerah*. One possibility is that since people might mistakenly think that the hyrax ruminates, the term was used in reference to it, even though it is inaccurate.

But this explanation is difficult. Would the Torah use an inaccurate expression just to take into account the impression that

some people mistakenly receive? It is not as though people would think it is kosher, as it lacks hooves. Additionally, it would seem to make far more sense (and a greater proof of its wisdom) for the Torah to state that the hyrax is non-kosher because it is *not* actually *ma'aleh gerah*! Still, one can argue that since, simply speaking, the Torah listed animals with one kosher sign to warn people against eating them, the warning was necessary in this case too.

A variation on this answer is that since most animals that chew in this way are cud-chewers, the term *ma'aleh gerah* is used idiomatically to refer to all animals that chew in such a way. This may be preferable, and it is somewhat comparable to pandas being termed "Carnivores" in contemporary zoology. The chewing manner has the advantage over the complex gut in that it is an external, very noticeable feature. On the other hand, it has the disadvantage that it is less of a fundamentally important similarity with ruminants.

Still, to say that an animal is described as bringing up the cud just because of its chewing habits is somewhat difficult. As noted earlier, it is difficult to posit that this phrase suddenly becomes an idiom. We noted earlier the legitimacy of such explanations, but applying it in this case is not straightforward.

It should also be noted that hyraxes are apparently not unique in this aspect. As we shall learn later, kangaroos also chew in this manner. Yet the kangaroo certainly does not possess hooves. If *ma'aleh gerah* is defined so loosely as to include the hyrax merely because of its manner and frequency of chewing, then the kangaroo, with its habitual gyratory chewing motion, would presumably also be admitted. It seems that we must therefore either rule out lateral chewing motion as qualifying for *ma'aleh gerah*, or state that the list in the Torah is not meant to include every animal in the world.

Is the *Shafan* the Rabbit or Hare?

The identification of the *shafan* as the rabbit or hare, with the *arneves* referring to the other of the two, is often suggested (although

this often stems from confusion surrounding the word "coney"). According to this, whichever explanation of *ma'aleh gerah* is used for the hare (such as cecotrophy) would resolve the usage of this term for both animals. The rabbit is so similar to the hare that it is somewhat difficult to imagine that the Torah would identify them separately from each other. However, there are certainly some visible differences between the groups, and such an explanation is not impossible.

A source that is sometimes offered for identifying the *shafan* as the rabbit (while the *arneves* would refer to the hare) is the Aramaic translation of Targum Onkelos which gives the name *tafza* (טפזא), meaning "jumper."[1] But this would not necessarily refer to the rabbit. We shall soon see that some understand *tafza* as referring to the jerboa, an animal particularly distinguished by its remarkable jumping ability. Rabbi Dovid Tzvi Hoffmann states that the word *tafza* could well refer to the hyrax, which also leaps from rock to rock, as is noted by scientists:

> All hyrax species, not only Dendrohyrax, are excellent climbers and jumpers; this has been observed in free living animals and also in captivity.
>
> K. Rübsamen, I.D. Hume and W.V. Engelhardt, "Physiology of the Rock Hyrax," *Comparative Biochemistry and Physiology A* (1982) 72:2 pp. 271-277

In any case, it is extremely unreasonable to state that the *shafan* is the rabbit or hare. The behavior of "building its home among the rocks" and "the rocks are a refuge for *shafanim*" does not match hares, which flee from danger by running, not by hiding. Nor does it match rabbits, which burrow into the earth rather than hiding in rocks.[2] Furthermore, there is a severe difficulty in explaining that

[1] See *Aruch HaShalem*, cited shortly.

[2] Rabbi Yosef Schonhak, *Toldos Ha-Aretz* (Warsaw: H. Bomberg 1841) vol. I p. 32, rejects identifying the *shafan* as the rabbit for this reason, as does *Kisvei HaRav Dr. Yosef HaLevi Zeliger* (Jerusalem: Defus Ivri 1930) p. 236, also cited in *Teshuvos R' Yitzchak HaLevi Herzog*, *Yoreh De'ah* 23.

either the *arneves* or the *shafan* refer to the rabbit as opposed to the hare: there are no rabbits in Israel, nor were there any in Biblical times, only hares. Rabbits lived only in the Iberian Peninsula and adjacent France at the time that the Torah was given.

It is likely that because there are no hyraxes in Europe (where the chain of Torah transmission largely occurred), the name *shafan* was transposed to Europe's closest contender, i.e. the rabbit. This seems to be what happened with the gazelle, called *tzvi* in the Torah. Because there are no gazelles in Europe, the name was transposed to the deer. But this does not fit with the description of the deer given in the Talmud (*Chullin* 59b). Rashi raises this problem and concludes that the *tzvi* is not the deer; he suggests that it is the ibex. However, *Tosafos* points out that the ibex does not adequately match the descriptions of the *tzvi* given elsewhere, and therefore *Tosafos* takes the difficult step of emending the text of the Talmud to match the deer. With the gazelle, which is how Rav Saadia Gaon identifies the *tzvi*, all the difficulties are solved; but Rashi and *Tosafos*, living in Europe, did not know of its existence. Likewise, the hyrax was unknown in Europe, and while authorities such as Rav Saadiah Gaon were able to identify the *shafan* as the hyrax, those in Europe substituted it with the rabbit.

Is the *Shafan* the Jerboa?

Some have identified the *shafan* as the jerboa, a small rodent that has long back legs for jumping and tiny forelimbs. This was first stated in the seventeenth century by Samuel Bochart in his *Hierozoïcon*, a comprehensive study of all the animals mentioned in the Bible.[1] This view was also adopted in the extended commentary

[1] Samuel Bochart, *Hierozoïcon Sive Bipertitum Opus De Animalibus Sacre Scripturae* ("A Natural History of Old: A Two Volume Work on Animals of the Sacred Scriptures") (London 1663), vol. 1 pp. 1001-1017. It was also proposed by Ernst Friedrich Rosenmueller, *Handbuch der Biblischen Alterthumskunde* (Leipzig: Baumgärtner 1823-1831) vol 4 part II p. 213-215. Both are cited by Dr. L. Lewysohn, *Die Zoologie des Talmuds* (Frankfurt am Main 1858), p. 110.

on the *Aruch* entitled *Aruch HaShalem* by Alexander Kohut (1842-1894), who identities the *shafan* with the name *dipus jaculus*. One of the subfamilies of jerboa is known as *Dipodinae* and it includes the genus *Jaculus*; hence, the *dipus jaculus* mentioned in the *Aruch HaShalem*. The two species currently found in Israel are *Jaculus jaculus* and *Jaculus orientalis*.[1]

Jerboa

Toldos Ha-Aretz[2] notes that the lexicographer Wilhelm Gesenius identifies the *shafan* as a particular species of jerboa. Gesenius relates the name *shafan* to an Arabic word meaning "cunning," and explains this to refer to the jerboa's ingenious habit of concealing the entrance to its burrow. However *Toldos Ha-Aretz* objects that since this jerboa lives in tunnels in the sand, it cannot be the *shafan*, which is described in Psalms and Proverbs as dwelling in the rocks. He therefore prefers to identify it as the *alkadaga*, which today in the form of Allactaga is a particular genus of jerboas. *Toldos Ha-Aretz* notes that the name *shafan* is translated in Aramaic as *tafza*, which means "leaper," and this jerboa is renowned for its particularly high jumps. He also claims that this species of jerboa does indeed make its home in the rocks.

[1] B. Shalmon, *Madrich Ha-Yonkim B'Yisrael* (Jerusalem: Keter 1993).

[2] Rabbi Yosef Schonhak, *Toldos Ha-Aretz* (Warsaw: H. Bomberg 1841) vol. I (*Toldos HaChaim*), *ma'areches ha-yonkim*, p. 32.

Jerboas are rodents, not ruminants, and they are not known to chew the cud. But it is possible that, like rabbits and hares, they engage in the process known as cecotrophy or refection. This refers to producing certain types of pellets that are reingested for further digestion; we shall discuss it in more detail with regard to the hare. Many rodents practice such behavior:

> To facilitate bacterial digestion of cellulose rodents have a relatively large cecum (appendix) that houses a dense bacterial flora. After the food they have eaten has been softened in the stomach, it passes down the large intestine and into the cecum. There the cellulose is split by bacteria into its digestible carbohydrate constituents, but absorption can only take place higher up the gut, in the stomach. Therefore rodents practice refection – reingesting the bacterially treated food taken directly from the anus. On its second visit to the stomach the carbohydrates are absorbed and the fecal pellet that emerges is hard and dry. It is not known how rodents know which type of feces is being produced.
>
> D. M. Stoddart, "Rodents: Equipped for Gnawing," *The Encyclopedia of Mammals* (Ed. D. MacDonald, Oxfordshire: Andromeda Oxford 2001), p. 580

Thus, it is possible that the jerboa practices cecotrophy, and that like the hare, the jerboa would be described as *ma'aleh gerah* because of this.

However, in any case it seems that the jerboa cannot be the *shafan*. The Torah is only listing *behemos* and *chayos* – relatively large mammals. Jerboas would be classified as *sheratzim*, creeping verminous creatures, which are prohibited from consumption in a different verse (Leviticus 11:41). Hence, the jerboa cannot be the *shafan*. (The hyrax is a significantly larger creature than the jerboa and is therefore defined as a *chayah*, albeit barely.) It may be possible argue that the long hind legs of the jerboa and/or its high leaps remove it from the category of *sheratzim*, which are defined as creatures that are low to the ground with indistinct limbs. Still, this

seems unlikely. Furthermore, despite the description given by *Toldos Ha-Aretz*, no species of jerboas is known to make its home in rocks; all live in tunnels excavated in sand or earth.

Summary

There are numerous lines of evidence that the *shafan* is indeed the hyrax, and we are left with having to account for the Torah's statement that it brings up the cud. There is a possibility that the hyrax does indeed practice merycism, which would qualify for the description of *ma'aleh gerah*. If this turns out not to be the case, it would be necessary to resort to various difficult explanations as to why certain biological features of the hyrax can be described as *ma'aleh gerah*, such as its ruminant-like manner of chewing. Whichever explanation is true (even merycism), we will see that there are other animals which share these features.