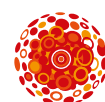


# Five-a-Day Felix

**A report into improving  
the health and welfare of  
the UK's domestic cats**

**By Dr Sarah Ellis and Dr Lizzie Rowe  
from International Cat Care**

**Produced for The Big Bang UK  
Young Scientists and Engineers Fair.**



**The Big Bang**  
UK Young Scientists & Engineers Fair

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# The Problem with the Domestic Cat

There are an estimated 10 million pet cats in the UK,<sup>1</sup> and current scientific data suggests that 39 – 52% of these cats are overweight or obese.<sup>2,3</sup> This is a problem for our feline friends, because being overweight or obese is a major health and welfare issue. A number of studies<sup>4-9</sup> have found that obesity is associated with a large range of diseases and health conditions in cats, including diabetes<sup>8</sup>, lameness<sup>8</sup> and cancer<sup>9</sup> to name but a few. Ultimately, being overweight or obese may lead to an early death in cats. In a study<sup>10</sup> of cats visiting vet clinics in the UK, increasing bodyweight above an ideal weight was found to be associated with a decreasing lifespan.

An overweight or obese cat may also struggle to perform many of the behaviours it is designed to do: for example, climb, hunt, explore and play. This inability to perform these instinctive behaviours could lead to cats feeling frustrated, or even depressed.

In order to understand why so many of our pet cats end up overweight or obese, frustrated and even depressed, we need to consider the ways in which cats naturally feed. Just like their wild ancestor, the North African/ Arabian wildcat<sup>11</sup>, the domestic cat (hereafter referred to as cat) is a predatory species and is an obligate carnivore – this means that they simply cannot be vegetarians and must eat a meat-based diet to survive.

The digestive system, physiology and biochemical pathways have become adapted to a meat-based diet – cats rely on protein as an energy source<sup>12</sup> and have an absolute requirement for a number of nutrients that are only found in an animal-based diet. As obligate carnivores, cats also have a reduced ability to digest and utilise carbohydrates, as a carnivorous diet is naturally relatively low in carbohydrates.<sup>13</sup> Reflecting this, one study has found that the daily energy intake of unowned, free-living cats (ie, those relying on hunting and scavenging for food) consisted of 52% from protein, 46% from fat and only 2% from carbohydrates.<sup>14</sup> Furthermore, cats have lost the ability to synthesise certain amino acids (the building blocks of proteins), because their natural diet contains an abundance of these amino acids found in animal flesh: these are taurine, arginine, methionine and cysteine.<sup>12</sup> Cats also require the vitamins niacin, vitamin D and vitamin A in their diet, again making them unique amongst many other animals, which are able to synthesise these nutrients themselves.<sup>12</sup>

## So just how does a cat meet these specialised dietary requirements in the wild?

Cats are naturally specialised solitary hunters, just like their wild ancestor. Since they hunt alone, their prey are generally small in size as this is all they can manage to capture on their own. The most common prey types are small mammals.<sup>15</sup> Since the average mouse only contains about 30 kilocalories, cats must hunt, kill and eat around ten mice a day in order to meet their daily energy and nutrient requirements.<sup>16</sup> Not all hunting attempts are successful,<sup>17</sup> meaning that cats end up burning a substantial amount of energy to obtain even one meal, and a large proportion of their time is spent obtaining food: feral cats can spend 12 out of every 24 hours looking for and obtaining food.<sup>8</sup> Both their senses and their anatomy are designed to help them hunt. For example, their large canine teeth (sharp conical-shaped teeth near the front of the mouth) allow them to accurately deliver a killing bite to prey by severing its neck vertebrae; and their large carnassial teeth (premolar or molar teeth near the back of the mouth with sharp cutting edges) make slicing flesh from bone a simple job.

Cats have undergone little in the way of selective breeding (in comparison, for example, with domestic dogs), and apart from pedigree cats we exert little control over their breeding. As such, the instinctive need to hunt remains a strong part of the cat's natural behavioural repertoire. Therefore, cats continue to display hunting behaviour, and will

hunt even when they are not hungry.<sup>19</sup> This makes adaptive sense, as hunting requires energy, and not every hunting attempt is successful; therefore a cat which waited until hunger kicked in before hunting would run the risk of running out of energy before successfully killing prey.

As our knowledge of feline nutrition has expanded, so pet food manufacturers have been able to understand the specialised nutritional requirements of the cat and develop foods that can meet all of their nutritional needs. The development of high quality complete commercial pet foods has meant that the full nutritional needs of cats can be met through good pet foods, rather than needing to hunt prey to supplement any food fed by humans. While the nutritional needs of a cat can now be fully met by their owners, the way cats are fed, coupled with the fact that the instinct to hunt still remains, does lead to a number of challenges for our cats.

Being reliant on food fed by owners means that most cats no longer follow their natural meal pattern of eating several small meals throughout the day and night, but are instead restricted to a feeding schedule that is convenient for the owner: often this means being fed two larger meals during the day – something that is both behaviourally and physiologically unnatural for cats.

## Modern Lifestyle Getting in the Way

Even if cats are given ad libitum access to food (meaning food is unrestricted and available at all times), which would allow them to eat little and often, their modern lifestyle may prevent them from regulating their calorie intake for several reasons.

1. Firstly, modern pet food is often developed to be highly palatable (very tasty), leading cats to keep eating the food even when they are full.
2. Second, commercial cat food is very easy to eat, as it is presented in small chunks of meat or bite-sized biscuits. This means that cats can eat the food very quickly, which may result in overeating.
3. Third, indoor-only cats may show increased attention to food through boredom, resulting in overeating. This, combined with a decreased opportunity for exercise through confinement, may increase the risk of weight gain.<sup>20-23</sup>
4. Fourth, neutering has been found to increase food intake in cats<sup>24</sup> (although it is very important to get your cat neutered to reduce the number of unwanted cats, and decrease undesirable behaviours such as spraying).
5. Finally, the presence of multiple cats in one household may lead to food competition and so overeating.<sup>2</sup>

Overeating and 'bolting' food are especially likely to occur if cats which do not get on with each other are forced to eat in close proximity with each other in attempts to avoid having to return to the feeding area, where the likelihood of meeting the other cats is higher.<sup>25</sup>

### Same old routine

Furthermore, most cats are fed their food in a bowl in the same location day in, day out, meaning little or no exertion is needed in order to obtain food. Gone are the opportunities to search for, capture and kill their food – all of which involve mental and physical exertion. For cats who only need to walk to their bowl for food, it is more likely that the calories they take in through eating will outweigh the calories they use up through exercise, resulting in weight gain.

### Behavioural impacts

A chronic lack of opportunity to interact with the environment and be mentally stimulated can lead to boredom, and this may result in apathy or anxiety.<sup>26</sup> For the cat, hunting is problem solving – firstly, the problem of finding the prey needs to be solved, then the problem of successfully capturing it and killing it has to be accomplished before eating can even commence.

Frustration and stress from a lack of opportunity to perform natural, instinctive behaviours may also reduce the cat's wellbeing and lead to the development of problem behaviours.

The long-term effects of the prevention of performing natural feeding behaviours has not been scientifically studied in cats, but is thought to be one of the factors associated with abnormal behaviours often observed in captive wild feline species<sup>27</sup>, such as pacing, circling, over-grooming and self-mutilation. The large proportion of the cat's normal time that would be dedicated to hunting is now vacant, and may lead to boredom and frustration exhibited as unwanted attention-seeking behaviours such as excessive vocalisation or destruction in the home, or even signs of withdrawal which could be linked to feelings of depression.

The way we are feeding cats generally does not match the lifestyle they were designed for. Whether or not individual cats exhibit signs of frustration and boredom as a result will vary, but there is no doubt that all cats would benefit through improved mental and physical stimulation. By making a few simple changes to the way we feed them, we can help our cats live longer, healthier and happier lives. Feline experts in veterinary medicine, behaviour and health at the charity International Cat Care (iCatCare) have put together a feeding plan to do just this.

# iCatCare's Feeding Plan

## 1. Five or more portions a day

In order to mimic the cat's natural feeding habit of eating little and often, without giving ad libitum access to food which could lead to overeating, owners should divide their cats' daily food ration into a minimum of five portions, which should be fed throughout the 24-hour period.

A cat's daily food allowance can be determined according to the cat's weight and the feeding instructions on the food packaging. If feeding dry food, weigh out your cat's daily allowance each day – this will only add a couple of minutes to your feeding routine, but could add years to your cat's life by preventing weight gain. Dry food is very energy dense, so the correct amount may look small, but provides all the calories a cat needs to stay fit and healthy. If you are feeding a mixture of wet and dry food, adjust the amount recommended in the guidelines accordingly: for example, if you are feeding half wet food and half dry food, divide the amount recommended by the guidelines by two for both the wet and dry. Note that the feeding instructions on the packaging are guidelines only, and may need to be adjusted for your own individual cat including, for example, to their activity level.

Portions can be fed throughout the day and night even when an owner is not at home or asleep, by using timed feeders (these can be set to release food at specific times) as well as puzzle feeders – see next page.

## 2. Puzzle feeders

To encourage mental and physical stimulation of cats during feeding, and to try to help mimic their natural hunting behaviour, cats should be fed several, if not all, of their portions in puzzle feeders. Puzzle feeders are objects which hold food and must be manipulated in different ways to release this food. They can hold both wet and dry foods. There are many types of puzzle feeders that are available to buy, but they can also be made at home, often very inexpensively. A variety of puzzle feeders should be used and not all at the same time so that cats remain challenged when trying to obtain their food.

A recent review<sup>28</sup> of the scientific literature provides evidence for many benefits of using puzzle feeders with cats. These include: reducing signs of stress, contributing to weight loss, decreasing aggression towards humans and other cats, reducing anxiety and fear, and eliminating attention-seeking behaviour and inappropriate toileting problems. The authors found that all cats can use puzzle feeders, even senior cats, kittens, three-legged cats, blind cats and cats with other disabilities! The review, published in the *Journal of Feline Medicine and Surgery*, the flagship journal of International Cat Care's veterinary division, provides an excellent overview of how best to introduce puzzle feeders to cats and how to overcome any potential challenges of using them. This article is free to access until the end

of March 2017 and can be found via the following link: <http://jfm.sagepub.com/content/18/9/723.full.pdf+html>.

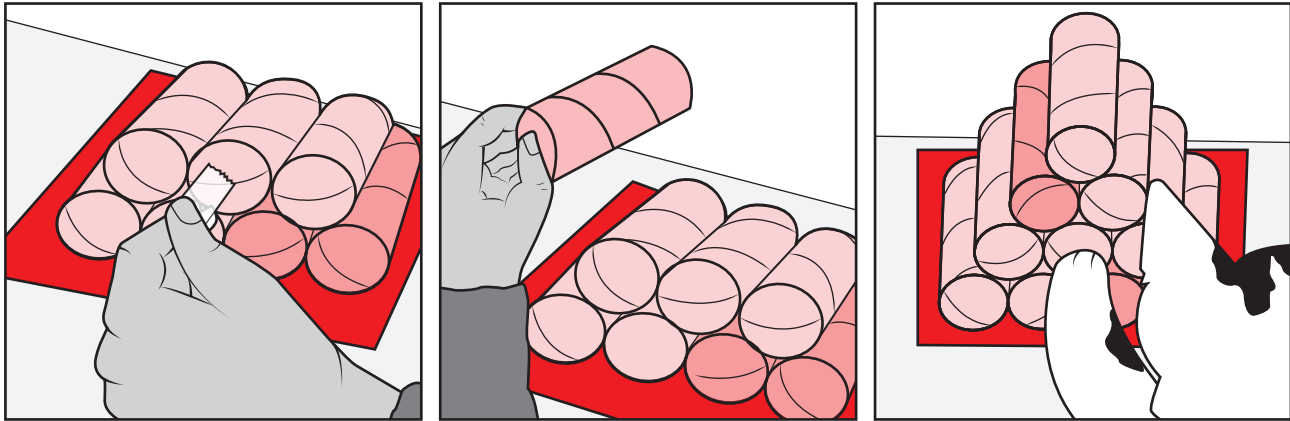
*The following page will show you how to make three different types of puzzle feeders at home. If your cat has never used a puzzle feeder, you should make the puzzle feeder as easy as possible to obtain food from (this is explained in the instructions), and build up the difficulty gradually.*

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# Puzzle Feeders

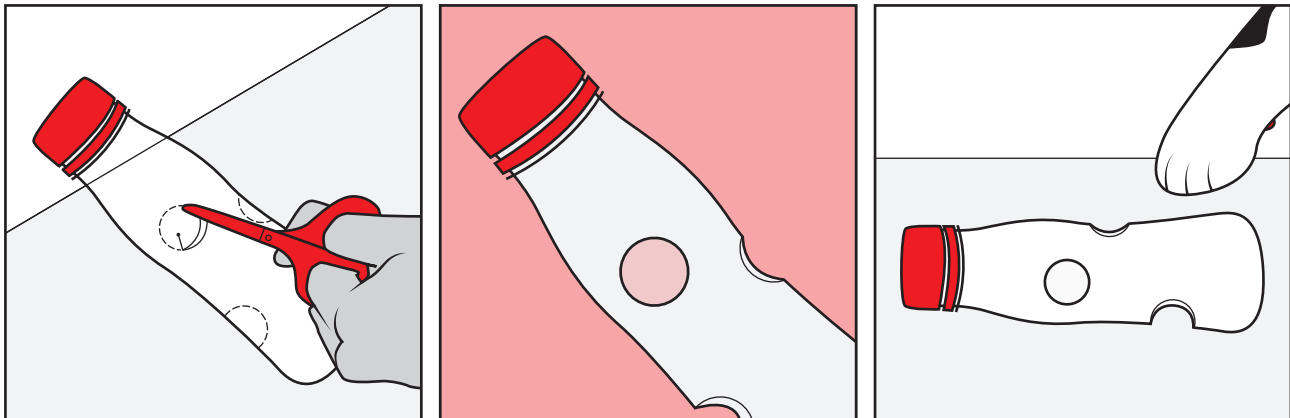
## Toilet roll pyramid (dry food)

This puzzle feeder requires around 10 rolls of toilet roll stuck into a pyramid shape using tape. It allows your cat to use its paws to fish out the food from inside the feeder



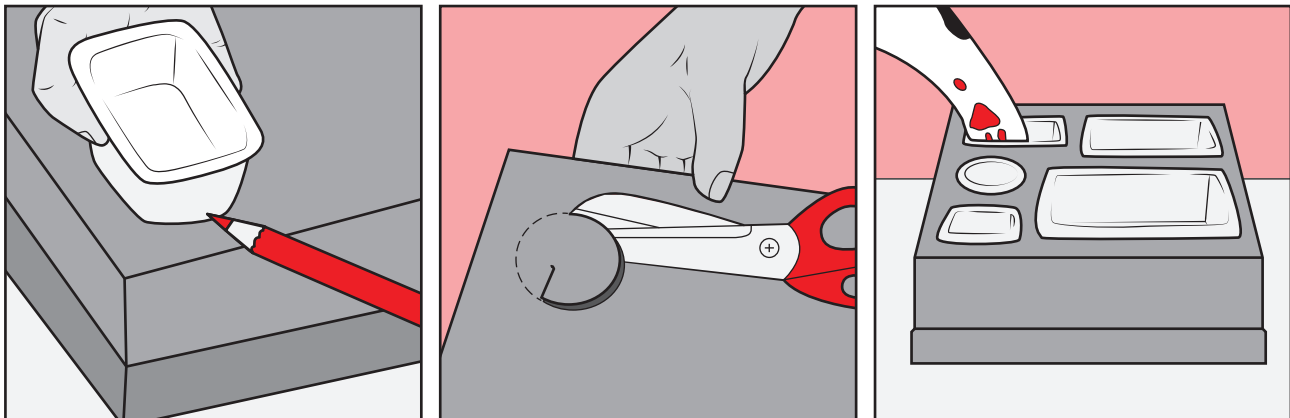
## Bottle puzzle feeder (dry food)

This simple puzzle feeder just requires holes being made into the plastic bottle for your cat's food to come out.



## Multifaceted puzzle feeder (wet & dry food)

This requires a shoebox and yoghurt pots. This gives your cat the chance to fish out its food using its mouth, tongue and paws.



## iCatCare's feeding plan (cont)

### 3. Change of location

When hunting, cats rely on multiple senses (sight, smell, hearing) to locate prey, which are unlikely to be found in the exact same location at each hunt. Therefore, placing a portion of food in a different location to the last, using new locations in the home as much as possible, will enable cats to engage these senses in searching for the food. Make use of vertical space as well as floor space, such as placing food on cat trees and shelving. Food can also be placed outside, but ensure that no food is left once the cat has finished eating as this may encourage neighbouring cats or other animals to come into the cat's territory. This will be an enriching experience for the cat by allowing them to express their natural hunting and exploratory behaviour, as well as encouraging them to exercise.

### 4. Day and night

Another great thing about puzzle feeders is that they can be filled with food ready to be left for a cat during the night. Having night-time access to a puzzle feeder enables cats to express their natural behaviour of hunting when it is darker, as this is the period when many rodents (a cat's main prey) are most active, and cats have evolved excellent night vision for this purpose. Puzzle feeders can also be left for cats when owners are at work, allowing at least five portions to be fed a day even if the owner is not at home. This means that feeding will be spread across the 24-hour period, which better reflects a cat's

natural feeding pattern.<sup>17</sup> This is likely to reduce attention seeking behaviour through boredom, and begging for food, especially in the morning when cats would have gone for a long period without being fed. An extra benefit of this feeding plan is reducing the risk of being woken up early by your cat asking for food!

### 5. Keep track of weight and body condition

It is important to keep track of a cat's weight and/or body condition score, in order to adjust their daily food allowance if necessary.

A body condition score is a way of determining whether a cat is underweight, overweight or just right, by judging their body shape and fat layers via both sight and touch. For more information on how to body condition score your cat, visit <http://icatcare.org/advice/obesity-cats>.

If a cat is putting on weight, then the daily amount of food fed should be reduced; if your cat was ideal weight but is now losing weight, the amount should be increased. If the cat is overweight, weight loss should be encouraged, but it is very important to make sure that the cat does not lose too much weight too quickly, which could lead to health problems: losing about 1% of their overall body weight per week is the recommended safe weight loss rate.<sup>29</sup> Therefore, weighing should occur on at least a weekly basis and the amount fed

adjusted accordingly. Note: if your cat has recently gained or lost a significant amount of weight, it is important to take your cat to the vet for a check-up.

### 6. Multi-cat households

To avoid food competition, all cats in the household should have at least one puzzle feeder of their own, and be given their portions in separate locations.

### 7. Type of food

One of the most important things to look out for when choosing a food to feed your cat is that it is a 'complete' food (this will be stated on the packaging). This means that it has been developed to meet all of your cat's nutritional needs. If the food is a 'complementary' food, then this will not be nutritionally complete and balanced, and cannot be fed as the sole type of food. Treats are an example of a 'complementary' food. Remember that if you feed treats, the amount of food from the rest of your cat's diet should be reduced accordingly, so that you do not feed beyond the cat's energy requirements.

Commercial cat food comes in both dry form (kibble) and wet (food in tins or pouches). Both types of food are considered to have benefits. For example, dry food may help improve oral health in cats<sup>30</sup>, and is also more suitable to use in certain types of puzzle feeders (for example ones that are designed to be rolled along the floor by cats). Wet food has a much higher water content than dry food, and so can help



ensure adequate water intake, especially as cats naturally obtain much of their water intake from their food (meat has a high water content).<sup>17</sup> Placing wet food in puzzle feeders can encourage cats to use their tongue and jaw muscles to extract food, partially mimicking the way cats would eat prey in the wild – wet food may also better replicate the meaty texture of prey.

It is extremely difficult to meet the cat's specialised dietary requirements with a home-prepared or raw diets. Although cats eat meat in the wild, this includes the internal organs, bones and skin of their prey, which are usually not included in a home-prepared or raw diets. Furthermore, feeding raw meat can pose a risk of disease transmission and bacterial infection. Therefore, this type of diet is not recommended.

International Cat Care generally recommends feeding healthy cats a variety of both wet and dry food so that cats can enjoy the benefits of both food types and so they do not become accustomed to only one type of food. Furthermore, feeding a mixed diet may reduce the risk of obesity developing, compared to feeding a dry only diet.<sup>23</sup>

## 8. Water

It is important to provide cats with fresh water every day, especially if you choose to feed only dry food. Cats prefer to drink away from their food; this natural behaviour is thought to reflect the need in the wild to choose a water source

away from a kill site to avoid drinking water potentially contaminated by the kill, eg, by the contents of the prey's bowels. Place several water bowls in different locations around the house. Try using glass bowls, as cats like to be able to see the water level. Shallow, wide bowls are often preferred, so that a cat's sensitive whiskers do not touch the sides of the bowl when drinking. You may consider providing a water fountain, as many cats like to drink from a moving water source (as this water is better oxygenated and so tends to be fresher than from a still source) – this includes drinking from the taps! Avoid giving your cats cow's milk. Most adult cats are lactose-intolerant,<sup>26</sup> meaning that they cannot digest the sugar lactose found in cow's milk, and so drinking it can give them diarrhoea.

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# About the Authors

International Cat Care is a charity passionate about improving the health and welfare of all cats. For over 50 years they have been raising the standard of treatment and care provided to cats by veterinary surgeons, veterinary nurses, boarding cattery operators, those involved in rescue work, breeders and, of course, cat owners, by providing the best information possible.

## **Dr Andy Sparkes** **International Cat Care's** **Veterinary Director**



Andrew Sparkes graduated from the Royal Veterinary College (University of London) in 1983, and after a period of four years in general practice joined the staff of the University of Bristol as an intern/resident in feline medicine in 1987, a post funded by the charity International Cat Care ([www.icatcare.org](http://www.icatcare.org)). Following completion of the residency he went on to a research appointment at the University of Bristol which led to the successful completion of a PhD. In 1993, Andrew was appointed as a lecturer in Feline Medicine at the University of Bristol (a position again funded by International Cat Care). In 1999 he was promoted to senior lecturer and then in the summer of 2000, he moved to the Animal Health Trust where in 2008 he took over as Head of the Division of Small Animal Studies. In 2010, Andrew became an independent consultant and then in 2012 was appointed as the Veterinary Director of International Cat Care and its veterinary division the International Society of Feline Medicine (ISFM). Andrew has published widely in the field of feline medicine, is a diplomate of the European College of Veterinary Internal Medicine and is the founding and current co-editor of the Journal of Feline Medicine and Surgery – the official journal of the ISFM and the AAEP.

## **Dr Sarah Ellis** **International Cat Care's** **Feline Behaviour Specialist**



Sarah has a keen interest in the behaviour and welfare of the domestic cat. After completing a degree in Zoology and Psychology (University of Bristol, 2001) and a Post-Graduate Diploma in Companion Animal Behaviour Counselling (University of Southampton, 2006), Sarah specialised in the domestic cat and was awarded a PhD for investigating ways to improve the welfare of cats housed in rehoming centres. Sarah has spent several years at the University of Lincoln as a Research Scientist working on numerous projects including investigating novel ways to improve feline welfare, and furthering our understanding of feline behaviour and the cat-human relationship. In 2015, Sarah decided to concentrate on the application of research and joined charity International Cat Care as their Feline Behaviour Specialist to help develop their work in the areas of feline behaviour and welfare. She also is a Visiting Fellow at the University of Lincoln where she remains involved in several feline related projects. Sarah also writes for several feline specialist publications including Your Cat and has appeared on BBC Horizon TV programmes 'The Secret Life of the Cat', 'Little Cat Diaries', 'Cat Watch 2014 : The New Horizon Experiment' and more recently, BBC Two's 'Cats vs. Dogs'. She has written a book with John Bradshaw entitled 'The Trainable Cat' which details how training can be used to improve cats' well-being.

## **Dr Lizzie Rowe** **International Cat Care's** **Distance Education Coordinator**



Lizzie has always been passionate about animals and animal welfare, and graduated from the University of Cambridge with a degree in Natural Sciences, specialising in Zoology, in 2009. Since graduating, Lizzie continued to develop this passion by working and volunteering for several animal welfare organisations, such as the RSPCA and Cats Protection. Cats have always been extremely close to Lizzie's heart, and in 2011 she undertook a PhD investigating early life risk factors for feline obesity at the University of Bristol. Lizzie was awarded her PhD in 2016 and began working for International Cat Care, to focus on disseminating knowledge on feline health and welfare to those who will put it into practice (vets, vet nurses, cat professionals and cat owners), in order to help improve the lives of cats all over the world.

## **Five-a-Day Felix**

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