

Civet Cat in China

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From antiquity, the scent glands or secretions of certain animals have been highly valued for use in perfumes. During the Sung Dynasty (10th-13th Centuries) Chinese merchants exchanged silk, brocades and weapons for civet from Africa; musk from the Far East was priced much higher than gold.

It is interesting to note that Li Shi-Zhen's (Ming Dynasty, 1519-1593) famous literature on Chinese medicine (Compendium of Materia Medica) said that although the civet had an unpleasant odour, it possessed a medical effect similar to musk. So for a long time, the secretion from Chinese civet has been used in perfumery and Chinese traditional pharmaceuticals.

The civet cat belongs to *viverridae* animal species, *civetticitis civetta* mainly living in Africa and *viverra zibetha* in Asia. In China, the main variety of civet cat is *viverricula indica* Desmarest which is widely distributed in the eastern and southern part of China.

Since 1962, with the help of the Scientific Research Institute of Fragrance & Flavor Industry, Ministry of Light Industry, the wild civets have been finally tamed and regular collection of their secretions also became possible. Now, the total number of civet cats in Hangzhou Zoological Garden is over 500.

Morphology and Ecology

An adult Chinese civet cat is 70-80 cm in length and weighs 2-4 kg. They are long and thin in body shape, with protruding mouth and narrow forehead (see photo 1).

Owing to its activity capacity and strong adaptability, the civet cat is a common animal, even a superior species in the high altitude areas and hilly lands. They live near areas of farmland,

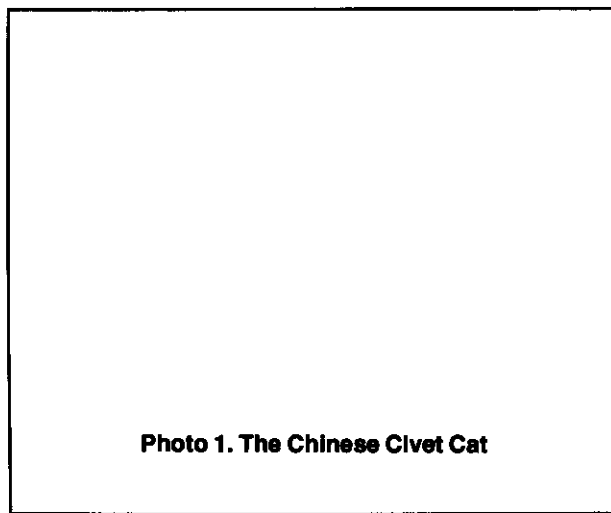


Photo 1. The Chinese Civet Cat

thick grasses, rocky crags, caves and ruined tombs. The civet cats dig holes deeply and tortuously in dark and peaceful places.

They are alert, good at climbing rocks and trees. Their most active time is at midnight. Changes of season, weather and foods will affect the pattern of their activities.

Civet cats, like other omnivorous animals, mainly feed on rats, fish, frogs, lizards, birds and snails.

Taming and Breeding

A civet cat is alert but timid of character. When first captured, they appear nervous, refusing to eat and running about. They become fierce when it is too bright but are quieter when it turns dark. The surroundings should always be kept quiet so as not to disturb them.

A recommended cage built with iron, bamboo or wooden sticks covers a space of one square meter and is 60 cm high. The civet's cage should be kept warmer in winter with the temperature usually not below 10 degrees C.

As it is an omnivorous animal, the civet eats a variety of animals and plants. Usually, the feed is fish and rice, commel mush or internal organs of chicken. It should be fed 500-800 grams daily.

At about two years of age, the civet cat is an

adult. Both in spring and autumn, the adult civet will make a noise "goo-goo" which shows oestrus. In spring, the period of oestrus lasts longer than in autumn.

For breeding, a couple of strong and similar in shape civet cats are put together into a cage. Most of them appear intimate, chasing and mating at night just as other animals of *Felidae*. The male holds the neck of the female in his mouth. After a short mating, the female cries sharply and runs away.

The average period of pregnancy is 90 days and three kittens are born to a litter. The newborn civet cat is 20-25 cm in length, weighs 75-120 grams and is able to climb before opening its eyes. It opens its eyes after a week and is weaned from its mother after three months. After breast feeding, the young civet is fed with fish in rice meal and some added calcium and yeast tablets to improve its growth.

Scent Glands and Secretion

The civet cat has a special sebaceous gland which is formed in hollow skin and can open and close freely. The anal sac is in the position of perineum, in the shape of a kidney and 25 x 20 mm to 40 x 45 mm in size. That of the male is bigger than the female's.

Table I. Quality of Pure and Adulterated Civet (*Viverricula indica*)

Origin	Pure Civet (Hangzhou Zoological Garden)				Adulterated Civet (oxidized, aged)	
	male		female			
Color	beige		beige		dark brown	
Odor	characteristic civet		characteristic civet		characteristic civet, less rancid	
Consistency	smooth creamy paste		smooth creamy paste		from hard to relatively soft paste	
Absolute content %	<u>max.</u>	<u>min.</u>	<u>max.</u>	<u>min.</u>	<u>max.</u>	<u>min.</u>
	53.5	37.5	50	35	56.4	32
Macrocyclic ketone % (Based on absolute)	50.62	31.68	84.74	59.66	66.47	50.62
Fatty acids % (Based on absolute)	50.84	39.19	31.70	6.09	38.81	29.69
Muscone % (Based on absolute)	0	0	1.81	0.27	2.19	1.52 (in female civet only)
Civetone % (Based on absolute)	24.27	22.43	43.17	9.32	25.22	7.80

When an anal sac is split, it is like a half-cut apple. There are many invisible holes on the sac. Among these holes, two larger holes on both sides of the upper part will secrete a viscous paste.

A convenient way was found to collect the civet secretion (see photo 2). A small cage is made of wood. When the civet cat is confined in this cage, the hind door is opened, the tail and the hind leg held by the keeper's hands outside the hind door, leaning tightly against the sliding door to expose the anal sac. The secretion is collected by squeezing.

About 30 grams of civet secretion can be collected from an adult civet cat annually. The collection is done once a week and about one gram or more can be obtained.

The records show that the cage temperature, feeding and noise will influence the yield of secretion.

By organoleptic evaluation, the quality of the secretions obtained from the walls of the cages seems better than the squeezed products. The pale yellowish oily civet secretion will turn to brown and be hardened by exposing to the air and light.

Composition of Civet Secretion

Although the Chinese civet secretion is strong and pungent smelling, it has a very noble musky note, gives fixative and mellowing effects, and has diffusion power in perfumery. (See Table I).

Some authors reported their studies on components of civet.¹⁻⁴ D. A. Van Dorp et al. found cy-

clohexadecanone, cycloheptadecanone, 6-cis-cycloheptadecanone, 9-cis-cycloheptadecanone (civetone) and 9-cis-cyclononadecanone in an African civet secretion, by using thin-layer chromatography, gas chromatography and mass spectrometric methods.³ Only very little information was known on the composition of Chinese civet until now.

Wishing to clarify the composition of Chinese civet, we studied the analytical works. The volatile components were separated by micro steam distillation-extraction. The chemical composition of the volatile components in secretion from the anal sacs of female and male civet (*Viverricula indica* Desmarest) was analyzed individually by using capillary gas chromatographical and GC-MS techniques.

Photo 2. Civet Secretion Collected by Squeezing

Civet Cat

By the analysis of volatile components, sixty-six compounds were found. Three indoles in basic fraction, forty-eight C₆-C₂₀ saturated and unsaturated fatty acids in acidic fraction and fourteen C₁₄-C₁₉ macrocyclic ketones, one macrocyclic lactone in neutral fraction. Besides civetone, the cyclopentadecanone and cyclohexadecanone are the main constituents. Other compounds are listed below.

Indoles found in civet

Indole
Skatole
1,3-dimethyl indole

Macrocyclic compounds found in civet

cyclotetradecanone	cycloheptadecanone
cyclotetradecenone	6-cis-cycloheptadecenone (civetone)
cyclopentadecanone	cyclooctadecanone
3-methyl-cyclopentadecanone (muscone)	cyclooctadecenone
cyclopentadecenone	cyclononadecanone
cyclohexadecanone	cyclononadecenone
cyclohexadecenone	cyclopentadecanolide

Fatty acids found in civet

2-ethyl butyric acid	undecanoic acid
2-methyl pentanoic acid	10-methyl undecanoic acid
4-methyl pentanoic acid	acid
hexanoic acid	2-ethyl undecanoic acid
5-methyl hexanoic acid	2,4,8-trimethyl undecanoic acid
4-methyl hexanoic acid	dodecen-9-oic acid
2-ethyl hexanoic acid	dodecanoic acid
2-methyl hexanoic acid	2-methyl dodecanoic acid
heptanoic acid	2-ethyl dodecanoic acid
2-methyl heptanoic acid	4-methyl dodecanoic acid
2-ethyl heptanoic acid	2,4,6-trimethyl dodecanoic acid
2,4-dimethyl heptanoic acid	10-methyl dodecanoic acid
octanoic acid	acid
4,6-dimethyl octanoic acid	tridecanoic acid
3,6-dimethyl octanoic acid	12-methyl tridecanoic acid
2-methyl octanoic acid	4,8,12-trimethyl tridecanoic acid
2-ethyl octanoic acid	tetradecanoic acid
nonanoic acid	2-ethyl tetradecanoic acid
2-methyl nonanoic acid	8-methyl pentadecanoic acid
7-methyl nonanoic acid	acid
2-ethyl nonanoic acid	2-ethyl hexadecanoic acid
2,6-dimethyl nonanoic acid	hexadecanoic acid
decanoic acid	octadecen-14-oic acid
2-ethyl decanoic acid	octadecen-11-oic acid
2-methyl decanoic acid	nonanedecanoic acid
8-methyl decanoic acid	arachidic acid

It is of great interest that muscone has been found in Chinese civet and *veverra zibetha* L.

but only in the female. It has been also found that the saturated and unsaturated homologues of macrocyclic ketones from C₁₄ to C₁₉ in civet appeared in pairs. However, the presence of these compounds is indicative of the high value of Chinese civet.

Ethology and Pheromones

The functional importance of pheromones for communication and their role in social life of mammals has been discussed by many authors.⁵⁻¹⁰ Some of these studies were focused on scent marking behavior and, consequently, the use of the perineal glands and the anal sacs, the most important glandular organs of viverrids for producing chemical signals, has been reported upon.

Only very few references on morphology of the organs and the chemical composition of the secretions are available for viverrids.

However, Ewer¹¹ and Wemmer¹² were able to study the behavior of captive specimens of *Civettictis*. Additional information on the ethology of the civet including scent marking behaviour is given by some authors.¹³

Not yet clarified, however, is the functional significance of the anal sacs of *Civettictis*, as well as *viverricula indica* Desmarest.

According to the results of our studies, it seems most probable that the entire epithelial lining of the anal sacs actively produces secretion. It is believed that the macrocyclic ketones and lactone are the important pheromones of civets. That muscone was found only in the female civets may show the great functional significance of the anal sac secretion as the pheromone for different sex of civet cats.

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