International Journal of Agricultural and Applied Sciences, June 2022, 3(1):102-105
https://www.agetds.com/ijaas
ISSN: 2582-8053
https://doi.org/10.52804/ijaas2022.3117

Research Article

OPEN ACCESS

Scent-marking of African Civet *(Civettictis civetta*, Schreber, 1776) in Aridtsy Forest, Western Ethiopia.

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(**Received:** 23/02/2022; **Revised:** 19/04/2022; **Accepted:** 01/06/2022)

ABSTRACT
The civetry sites of African Civet were investigated in the Aridstey forest Western Ethiopia during August 2017-January 2018. The civetry sites were identified and the scent marking sites were also located. The scent markings were at the height of 32-39 cm above the ground and the civets scent marked mostly on Eucalyptus sp., Clausenia anisata, and Capsicum annuum in the present study area.
Keywords: Africa n civet, civetry site, scent, Aridtsey Forest.

INTRODUCTION

Ethiopia is located in the horn of Africa within the tropics, and is a relatively vast country with a land area of 1.12 million square kilometers with a wide variety of topography and climatic patterns. There is a great variation in altitude ranges of different areas in Ethiopia, ranging from 116 m below sea level in the Danakil depression to 4620 m asl at the top of Ras Dashen. The great plains of Ethiopia lies atop two massive highland plateaus, cloven in the middle by the Great Rift Valley. Much of the interior of Ethiopia is dominated by highland plateaus, and are home of numerous endemic species of flora and fauna (IBC, 2010). Ethiopia is subdivided in to three physic-geographical regions considering morph structure, relief, climate, soil and vegetation, Ethiopian highlands (also referred as the western plateau), Ethiopian-Somalia Plateau (the eastern plateau) and the Great Rift Valley.

Ethiopia is the home of diverse wild animal species, some of which are endemic to the political boundary of the country. There are over 288 species of mammals in Ethiopia (IBC, 2007). The family Viverridae includes subfamilies, Hemigalinae, Paradoxurinae and Prionodontinae. Under this family five genera and 22 species are reported, of this African civet (*Civettictis civetta*) is the largest representative among species. Post-canine dental formula of this family varies; alispenid canal present or absent; sometimes without five digits on all feet. There are spots and/ or bands and /or stripes on dorsum and /or sides of the body if dorsal and lateral markings appear to be absent and tail is ringed, then paler rings not white or whitish.

Carnivores are ecologically diverse, including species that spend time on land, in freshwater and/or in the sea; ranging from entirely arboreal to ground-dwelling; and occupying a range of habitats from desert to moist tropical forests, and from below sea level to more than 4,000 masl. As with mammals in general, carnivores are not equally distributed around the world. They are more concentrated in tropical areas (Schipper et al., 2008). As stated by Rabinowitz (1991), Civets play a variety of biological roles as predators, prey, and seed dispersers. Viverrids are ground dwelling generalists. They resemble with other carnivores like, dogs, weasels and cats. Civets are distributed widely, not only limited in natural habitats but also found in villages, farmlands and human surroundings (Balakrishnan and Sreedevi, 2007). African civets are larger and more dog-like than the small Indian civet (*Viverricula indica,)*.

Viverrids have prominent scent glands around the posterior quartess known as perinal gland. This gland is situated between the anus and the genital organ, which produce a strong-smelling substance used for defense, territory marking and for communication (Aroon, 2008). As stated in Lekagul and McNeely (1977), these glands are most developed in civets and genets.

African and Asian civets are currently exploited for their valuable perineal gland secretion known as ‘civet’. The African civets are kept in captivity by civet owners in Ethiopia, solely for production of this ‘civet’which is exported for the perfume industry. Until the end of 1980s, African Civets were kept in large numbers in captivity for collection of “civet” in Ethiopia and Zanzibar, which constituted major export sources into the international market (Bekele Tsegaye *et al*., 2008).

In general, the soles of viverida are hairy, but those of *Civetticictis* are naked anterior to the central pads. The hind feet of them lack a metatarsal pad. The claws of

viverides in general are short, semi-retractile and protected by lobes of skin, where as those of the *Civetticictis* are long and non-retractile (Ray, 1995).

African Civets tend to be most active just after sunset and tends to hunt in areas that provide plenty of cover. Civets do not possess carransial teeth, and are known to be omnivorous, eating fruits and carrion as well as a wide variety of small vertebrates and invertebrates (Ewer and Wemmer, 1974). African Civet has a varied diet that consists of both animal and plant matters. They feed on snail, insects, millipedes, centipedes, birds, rodents and plant matters such as fruits with seeds (Bekele Tsegaye *et al*., 2008; Mudappa *et al.*, 2010). Their faeces contain mixtures of soaps, plastics, and honey combs in human surroundings (Iida *et al*., 2012). A study in Menegasha-Suba state Forest, Ethiopia revealed the most common food items of the Civets were flesh of small animals such as rodents and birds, fruits of *Ficus* and *Maytenus*, millipedes, centipedes and insects. The diet also varied seasonally, based on the availability of food items (Bekele Tsegaye *et al.*, 2008).

MATERIALS AND METHODS

The following materials were used during the present investigation: Binocular, Night Vision scope, GPS, Camera and Meter

In the Aridtsey forest, a preliminary survey was conducted in the forest and nearby areas in July, 2017 to locate civetries and African Civet scent-marked sites. Locating Civet habitats with the presence of civetries and scent-marked sites, the study areas were marked for routine data collection. Wet season data were collected from August to October, 2017 and the dry season data were collected from November, 2017 to January, 2018, for a total of six months.

From each of the study habitats, three study sites were chosen based on their distance from the civetry. These sites were checked for 15 days/month for fresh droppings. Scent marked locations were also observed and assessed for frequency of marking. Perineal glandular secretions were removed the scent marked sites to check whether the Civets remark on the same location, on the same object. The objects that were scent-marked, path of marking and the color change of the "civet" were recorded.

Scent Markings

The following information was recorded from the scent marked objects. Height of the object at which the marks were laid, GPS location, the color of the markings, the distance objects to the nearest latrine sites. All plants on which scent mark were located were identified.

Quadrats

To identify the preference of scent marking of the Civet on a specific plant species, quadrats of $5x5m^2$ were laid in different parts of study areas. Based on the proximity to the latrine the quadrat was laid in the site by following the methods of (Sutherland, 2006). Each plant of this plant species in the quadrat was counted.

RESULTS AND DISCUSSION

Height of sign posts at which scent marks are laid by Civets

In Aridtsey forest, a total of 58 scent marked objects were located. The height at which scent marked ranged from 32-39 cm above the ground. Markings were observed on plant matters.

Scent markings of African Civet on different objects

During the present investigation, the African Civets scent-marked in greater proportion on *Eucalyptus* trees in the plantation habitat, followed by *Clausenia anisata* in forest habitat. The *Eucalyptus* tree is dominantly cultivated in plantation habitat. There were abundantly markings on *Eucalyptus* and *Clausenia anisata* (Table, 1). The surface of both these species had comparatively smooth area.

Table1. Height at which scent marks of the African civets were located on the environmental sign-posts.

Scent marked	Height (cm)	Number of marked	%
Eucalyptus globules	33,34, 35, 36, 33, 37, 32, 34, 36, 34.5	20	34.48
Pennisetum schimperi	33, 35, 39, 37, 33, 36, 34, 38	10	17.24
Acacia abyssinica	37, 33,	2	3.44
Clausenia anisata	34,35, 37, 38, 34, 36, 37, 38	18	31.03
Capsicum annuum	39, 32,34, 33	8	13.79
Total		58	100

Observation days of African civets in civetry sites

African Civets were observed at night in civtery sites. The African civets were more observed at around 22:00_23:00 h (Table 2) in the civetry sites. Most the observations were in forest and plantation habitats.

Table 2. Number of sightings of the African Civets during the present investigation

Time interval	Habitat	Number of days observed
19:00-20:00	Plantation	6
20: 00- 21:00	Agricultural	7
22:00-23:00	Plantation	8
23:00-0:00	Plantation	9
00:00- 1:00	Forest	4
02:00-03:00	Agricultural	2
06:00-07:00	Among	0

Distance of scent marked objects from the civetry site Randomly selected quadrats in forest habitat

During this investigation, African Civets scent-marked on objects, i.e. on the plants little away from the civetry sites. Most of the markings were located between 20-100 m distances from the civetries (Table 3).

Table 3. Distance of scent-marked objects from civetries in the forest habitat

Quadrat number	Distance from civetry (m)	No. of scent-marked objects searched for scent	Unit marked sites(m^2)
1	20	4	25
2	50	6	25
3	70	3	25
3	100	7	25
4	300	2	25
5	500	1	25
6	600	1	25
7	700	-	25
Total		24	

Randomly selected quadrats in plantation habitat

From the seven randomly selected quadrats in plantation habitat, one quadrat had no scent marked objects. The scent-marked objects were more at a distance of 50 m and 100m followed by 20 m (Table 4). No markings were found with at a distance of 0-20 m during investigation.

Table 4. Distance of marked objects from civetries in the plantation habitat

Quadrat number	Distance from civetry (m)	No. of scent-marked objects	Unit area searched for scent-marked sites(m2)
1	20	4	25
2	50	5	25
3	100	5	25
4	400	3	25
5	500	2	25
6		1	25
7	600	-	25
Total	700	20	

Randomly selected quadrats in agricultural habitat

During the investigation, nine quadrats were laid in the agricultural habitat. Observations in this quadrat showed the Civets scent-mark not in the close surroundings of the civtries but thy make at a distance. The maximum numbers of plants with markings were observed at a distance of 100 m followed 20 m from the civetry site whereas; in far distances there were no scent-markings (Table5).

Scent Marking

Scents are often overlaid by wild animals passing through the same way, indicating that the scent may provide olfactory information such as sexual and individual status (Kingdon, 1977).

Table 5. Distance of scent-marked objects from civetries in the agricultural habitat

Quadrat number	Distance from civetry (m)	No. of scent-marked objects	Unit area searched for scent-marked sites(m^2)
1	10	4	25
2	20	6	25
3	30	3	25
4	100	7	25
5	300	2	25
6	400	1	25
7	500	1	25
8	600	-	25
9	700	-	25
Total		24	

During the present investigation, repeated scent markings of African Civets were observed on the same plant. These markings were persisting for a long duration of time on the marked sites. Most markings were found on *Eucalyptus* tree during the study period (Fig.1). As reported earlier by Wondimegegne Daniel *et al*. (2011).

Figure 1. Scent markings of African civet on different plants (photo by author; August, 2017).

At the border of the forest *Eucalyptus* trees are available as planted by for fodder. Among the habitats scent markings were observed on different sign posts such as plant; more markings were found on plants with smooth stem (Bekele Tsegaye *et al*., 2008). The colour of marked secretions was found to change fresh marking was yellowish in colour whereas after a couple of days, it was changed to brownish black. Most of the markings were observed at around 32-39 cm height above the ground and this height might tell the approximate height of the animal. African civets scent mark on different objects such as fences, plant stem, branches, fences and electric poles to communicate with others.

African Civet marks their scents on tracks, especially on the road sides, and around human surroundings (Bekele Tsegaye *et al*., 2008). In this study area, during the wet

season the scent markings were less than during dry season. The possible reason might be, the availability of food less during wet season and here in there exists shortage of food compared to the dry season. As already revealed fruits mature during the dry season and here civets have plenty of fruits to eat during this season. Civets scent mark territories and tree branches with their scent (Aroon, 2008). It was all observed that Civets defecate on exposed roots, but there was no sign of scent markings on the same tree. It might be, due to the fact that feces itself might be the sufficient to indicate to territories for the intruders. African Civets mark their scents on different objects especially on road-sides and on foot paths (Wondimegegne Daniel *et al.*, 2011). Most of the Civet markings faced on the road side (Randall, 1979).

Frequent marking on the road side would to leave communication messages to others of the same species which might enumerate scent marked locations. Sign-posts are marked by rubbing the glandular area on the specific site. During the dry season, more marking of Civets was observed most probably due to higher levels of evaporation, the odour may diminish and hence repeated marking are required. During the present investigation, more marked plants were found little distance far distance from the civetriy sites, 20, 50 and 100 meters.

Scent marking is commonly described as a territorial behavior, and scent marks might deter potential intruders from entering the already occupied areas (Jordan *et al.*, 2010).

CONCLUSION

Based on the present investigation, marking frequency was varied with the season depending on the availability of food items. Civets did not prefer the habitat type and mark on different plants from this investigation there were abundantly markings on *Eucalyptus* and *Clausenia anisata*. And the marks are laid in 32-39 cm above the ground of plant trees. Commonly the marks were found near to sites but the marks were not found in far distance from the habitat.

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Citation: Ayene, D. S. and Bayissa, B.T. 2022. Scent-marking of African Civet *(Civettictis civetta*, Schreber, 1776) in Aridtsy Forest, Western Ethiopia. *International Journal of Agricultural and Applied Sciences*, 3(1):102-105. https://doi.org/10.52804/ijaas2022.3117