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USE OF A GARBAGE DUMP BY SOME MAMMAL SPECIES IN THE MAJELLA MASSTF (ABRUZZO, ITALY)

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ABSTRAC'I' - In several previous works the presence of urban solid wastes in the feeding habits of some animal species has been documented. This study was carried out to discover which specie, visit a rubbish dump located in an area of the Majella massif. Monthly nightime direct observations, from September 1990 to May 1992, revealed the presence of dogs *Canis [lupus] familiaris*, domestic cats *Felis [silvestris] catus*, wolves *Canis lupus* and red foxes *Vulpes vulpes*. The fox was the most frequently observed species. Fox visits to the dump were distributed more continuously during the entire period of the study then the other species. An "asymmetry analysis" was carried out to find out the animals' favourite time to use the dump. The analysis produced time lag values of 02:00 A.M. to 05:00 A.M.

The wolf was observed the least. During the monthly observation\ a similar trend between the cat and wolf came to light. The two species also visited the dump at similar times (wolf 07:00-11:00 P.M.: cat: 05:00-10:00 P.M.).

Dog visits to the dump were Icss continuous in comparison with other species: no preferred time was revealed.

Some environmental factors. related to the geographical area and management of the dump limited waste availability. This probably had an effect on the presence of the animals.

Key words: Waste dump, *Canis lupus*, *Canis [lupus] familiaris*, *Felis [silvestris] catus*, *Vulpes vulpes*, Majella massif, Italy

INTRODUCTION

Urban rubbish dumps represent a considerable source of alimentary subsistence both due to their easy accessibility and for their inexhaustibility. This is why they attract several animal species very strongly. Some of these species feed directly on human meal left-overs (e. g. insects, rodents). Others use the dump as a hunting ground (e. g. nocturnal and diurnal raptors, insectivorous birds), or for both the above purposes (e. g. crows, domestic cats. wolves. foxes). Several past studies have reported the presence of waste in the feeding habits of some animal species. In particular it has been demonstrated how common waste is present in the diet of some mammals (e. g. Scott and Causey, 1973; Macdonald ct al., 1980; Prigioni et al., 1988; Pandolfi et al., 1988; Pandolfi and Bonacoscia, 1991: Boldreghini and Pandolfi, 1991') and birds (e. g. Meschini et al., 1981: Mocci Demartis and Melis. 1985; Mainardi, 1988). However, it was suggested by Macdonald et al. (1980) that the appearance of waste in the diet of certain species most probably depends on the lack of natural food, such as prey for carnivorous mammals. Infact in the areas in which prey is more abundant the use of waste as food supply is rare. From previous papers, it seems that exploiting rubbish dumps has become a profitable habit for certain species for two main reasons: an intrinsic one, concerning the spe-

cies ecology, and an extrinsic one. due to the lack of natural prey and the fact that feeding off human waste is easy.

OBJECTIVES

In the second hall of the seventies. the leading role of rubbish dumps as food sources for both wolves *Canis lupus* and red foxes *Vulpes vulpes* was pointed out in studies in the Majella area (Macdonald et al., 1980). Recently, the need to verify if the dumps were still visited by wild animals has arisen. The present research was planned to investigate the following topics:

1. list of the species which visit the dump;
2. seasonal variations in use of the dump;
3. dump use frequency in the time range of the observations (from dawn to sunset).

STUDY AREAS

The rubbish dump observed in this study belongs to the administration of the Village of Campo di Giove (in l'Aquila province) and is located in the south-western side of the Majella massif. The rubbish dump is partially fenced. However this does not prevent animals from entering it. The dump is situated 2,5 km away from the village at an altitude of 1100 meters a.s.l..

MATERIAL AND METHODS

Direct observations

Monthly observations were made inside the dump from September 1990 to Maj 1992. These were divided into three time lags (from 05:00 P.M. to 09:00 P.M.. from 09:00 P.M. to 01:00 A.M., from 01:00 to 06:00 **A.M.).** The observations were undertaken from a car which had dark windows. **A** pair of binoculars (8x56) and a light intensifier for night vision (5x) was used. In extreine conditions (cloudy arid moon-less nights), a halogen lamp (100 watt) **was** necessary. Due to the long time lag, the low night temperatures and the extend use of the optical instruments, 20 minutes of continuous observation were alternated with 20 minutes of rest. to reduce imprecisions in observation caused by weariness.

The complete report consists of 399 twenty-minute continuous observation intervals that add up to a total of 133 hours (76 in 1990-91, 56 in 91-92). The sampling method used was *ad libitum* (Lovari, 1980; Martin and Bateson, 1990).

Elaboration

A report was carried out to see if any species had favourite times for visiting the dump. To do this an analysis method that allows to obtain the asymmetry index "*a*" was done according to Leti (1983). The index was obtained by gathering the siphtings of every single species in six time intervals (OS:00-07:00 P.M., 07:00-09:00 P.M., 09:00-11:00 P.M., 11:00 P.M.-01:00 A.M., 01:00-03:00 **A.M.**. 03:00-05:00 A.M.). After having calculated the median value of the series which represents the sightings distribution, we calculated the dispersion index D:

$$D = 2 \sum_{h=1}^{k-1} F_h(1-F_h)$$

where F_h is the accumulated relative frequency related to the h^{th} modality. The asymmetry index a is obtained by the formula:

$$a = \frac{D_d - D_s}{D_d + D_s}$$

where D_s stands for the distribution index concerning the first $n/2$ terms (n even) or the first $(n + 1)/2$ terms (n oddj and U, stands for distribution dispersion index concerning the last $n/2$ terms (n even) or the last $(n + 1)/2$ terms (n odd). If $D_d = D$, the result is symmetrical, if $D_d > D_s$ it is positively asymmetric, if $D_d < D_s$ it is negatively asymmetric. Moreover if $U, = 0$ it follows that $a = 1$, which is maximum positive asymmetry. If $D_d = 0$ it follows that $a = -1$. which is maximum negative asymmetry.

RESULTS AND DISCUSSION

The data on which we worked on concerned only animal sightings of which identifica-

tion was 100% certain. We didn't consider the sightings where the shape of tlie observed animal was not clear or where we could only distinguish its *tapetum lucidum*'s retlex. Moreover we could only cover 70% of the dump's area from the car. so logically the effective level of animal presence is probably higher than the one recorded during tlie study.

Observed species

In the two-year period of study, 111 animal presences were recorded (65 in 1990-91 and 46 in 1991-92).

The following species were observed: the red fox *Vulpes vulpes* (39% of the sightings), the domestic cat *Felis [silvestris] catus* (27%), the dog *Canis [lupus] familiaris* (20%), the wolf *Canis lupus* (14%).

The absence of characteristic markings on the wolves and red foxes meant that the identification of a single individual of the same specics was impossible. In Tab. 1 the sightings percentage related to the number of individuals seen at the same time during a single observation is reported. Most of the sightings relate to a single individual in the case of the cat, the wolf and the red fox. Dogs for the most part canie in groups from two to six individuals.

Monthly presence trend

It was impossible to carry out an in-depth statistical analysis **of** seasonal variations in dump use for each species. This was because the numbei- of sightings was insufficient and the study period was very limited because the dump was closed down in June 1992 so the research couldn't continue. As a result wc have limited ourcelves to simply reporting the results in graphic form and we have hypothesized on some trends.

The trend in monthly presences (Fig. 1) during the first year is different from the one obtained in the same months of the second year. This difference is probably due to the changes in waste supplies which depended on the random and discontinuous garbage removal undertaken by the village administration (the removal was done by burying the waste with a bulldozer). The burying was done constantly only during March, April and May 1991: the lack of waste supplies could explain the almost total absence of animals during this period.

The observations during September, October and November 1991 show **a** similar trend of presences for the four species. However this similarity was not found in the same period of the following year. The highest attendance absolute maximum (relative maximum in the dog) during the entire period of study was recorded in October. A number of different reasons could explain these results. During autumn micromammals represent an important food source for the red fox (Pandolfi and Bonacoscia. 1991) and the dump is a favourite settling area for some rodents. This was found to be sure in particular for *Rattus* sp. (pers. obs.) so, consequently. this high density could be a further attractive factor for predators.

Table 1 - Sightings percentage in relation to the number of the individuals at the same time visible to the observer.

1990-1992	1 ind.	2 ind.	3 ind.	4 ind.	5 ind.	*h* ind.	Total number of sightings
WOLF	62,5 % (10)	18,7 % (3)	6,25 % (1)	12,5 % (2)	0	0	16
RED FOX	67,4 % (29)	23,2 % (10)	6,9 % (3)	2,3 % (1)	0	0	43
CAT	76,6 % (23)	23,4 % (7)	0	0	0	0	30
DOG	13,6 % (3)	36,4 % (8)	18,2 % (4)	0	18,2 % (4)	13,6 % (3)	22

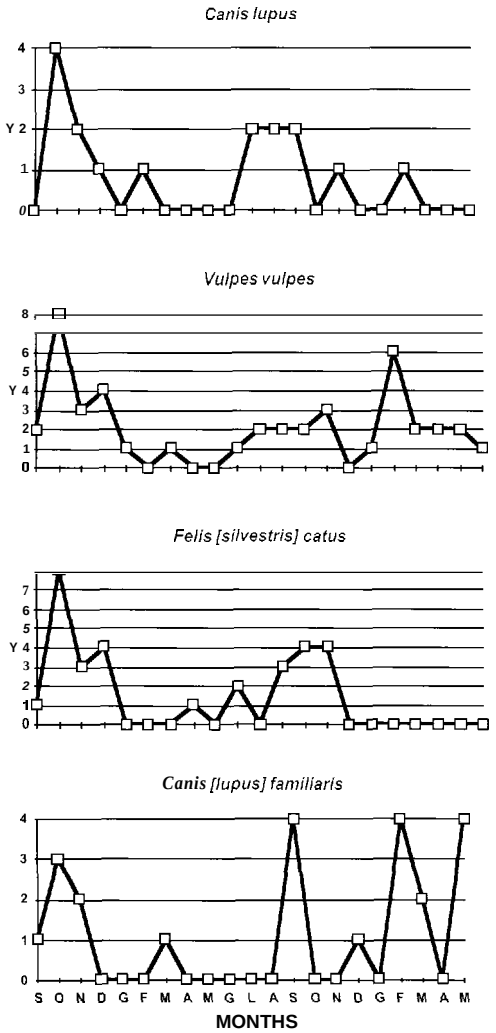

Figure 1 - Observed species presence (monthly trend) (September 1990 - May 1992)

In winter. snowfalls covered the garbage heaps and the low night temperatures froze the mantle. so making any attempt by the animals to dig for food very difficult. Furthermore. because of the snow, the garbage discharge was not performed daily, but only after the streets had been cleared for the truck to move. The presence or absence of animals could have depended on the bad weather conditions that limited the waste supplies to those disposed in between two snowfalls. However the red fox showed an attendance peak in January '92. Its attendance peak shift to January could be because of a hole up in the dispersion of red foxes in the area due to a delay in the reproductive cycle of that year. In fact, as Storm et al. report (in Boitani and Venditti, 1988), the beginning of the young red foxes dispersion period could depend on the cub birthdate and on their growing and maturity phases.

The increase of the human population during the tourist season and the consequent increase of daily waste could be the main factor that attracted red foxes, wolves and cats to the dump in summer.

A comprehensive comparison of the graphics shows that the red fox visited the dump with the most continuity over the whole 21 month period. The wolf and the cat visited the dump for shorter periods and the dog was the more irregular of all. The red fox's wide feeding range could account for its frequent visits to the dump.

The howls, the marks **on** the snow and other factors revealed us the presence of a pack of wolves (2-6 individuals probably) in the south-western area of the Majella during the period of study. Boitani (1982) reports the wolf as strongly dependent on waste in Abruzzo. On the other hand a scarse dependence was recorded by Patalano (1991) in the Abruzzo National Park, and Matteucci (1992) reported that wolf feeding habits in the northern Apennines area are totally orientated towards wild ungulates. We observed single individuals more frequently (in 62,5 % of the sightings) in the dump.

The sightings of the cat resulted in being the same individuals (2). In a Swedish population of a rural free roaming domestic cats. Liborg (1980) classified them as house cats when they regularly fed in one or several household and he classified cats that didn't have such connections as being feral. The feral cats usually had a larger home range (2-4 km) than the house cats. Taking into consideration the long distance between the

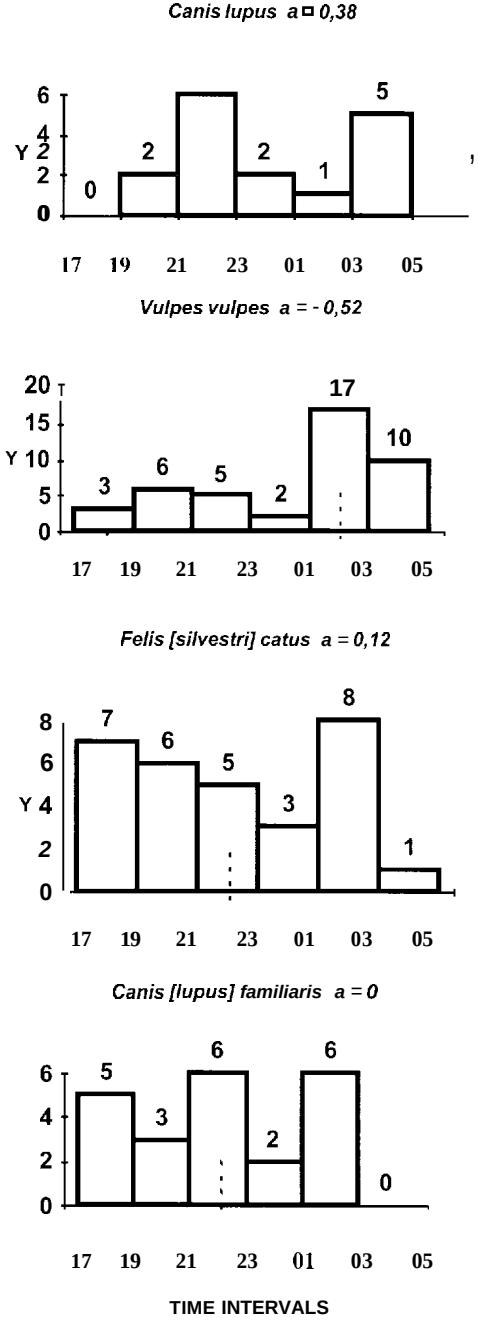

Figure 2 - Number of species observations in relation to time lags. Besides the species scientific name the asymmetry index value "a" is reported; the mean value is shown by the vertically dashed line.

dump and the nearest village we can probably assume that the cats we observed were ferals.

The dog was observed many times even during daytime and probably visited the dump for the whole 24 hours. We can conclude therefore that it is far more dependent on waste food than the results could lead us to think.

Asymmetry analysis

The values obtained in the asymmetry analysis application were as follows: the wolf $a = +0,38$; the red fox $a = -0,52$; the domestic cat $a = +0,12$; the dog $a = 0$. The sightings number per species in relation to the time intervals and the related asymmetry index is shown in Fig. 2.

As far as the wolf is concerned two peaks of maximum attendance were recorded in two intervals. 09:00-11:00 P.M. and 03:00-05:00 **A.M.:** despite the fact the positive value obtained for the asymmetry index ($a = 0,38$) indicates a favourite visiting time interval between 07:00-11:00 P.M. The asymmetry index was found to be positive for the cat ($a = 0.12$) and the favourite visiting time interval was in the evening hours (05:00-10:00 P.M.. The red fox's asymmetry index was found to be negative ($a = -0,52$); so, consequently it follows that the favourite visiting time has to be restricted to the late night hours (02:00-05:00 A.M.). Plus, the red fox's activity reported in Cavallini & Lovari (1994) is very intense late at night (12:00 P. M. - 02:00 **A.M.),** but its maximum was between 08:00-10:00 P.M.

We obtained an almost perfect symmetry only for the dog ($a = 0$), which suggest the visits between 05:00-10:00 P.M. were as much appreciated as those between 10:00 P.M.-03:00 A.M.. The absence of a favourite visiting night-time is probably due to the possibility of frequenting the dump in the day-time too.

Different species were sighted in the same time intervals but, we cannot ascertain if the presence of one of these had an intluence on

the presence (sending away or approach) of other species. We can only report single episodes that could lead to a wide range of conclusions. In fact these suppositions could be a good starting point for new deepened research:

October 12. 1991 - 00:40 A.M. - "A wolf, a cat and a red fox were present at the same time. Although each one was aware of the others no physical interaction took place". A similar event is also reported in Boitani (1988).

November 20. 1991 - 1:20 A.M. (videotaped sequence) " A red fox and two domestic cats are present at the same time: the three animals are moving together (the fox proceeding at a jog-trot while scavenging and the cats moving step by step). The red fox is repeatedly driven away by the cats, perhaps because it is too close".

February 2, 1992 - 10:40 P.M. " A little dog pack is present in the dump: 2 adult males. 1 adult female and three puppies. A wolf is a little farther away inside the dump. The adult dogs, barking and running. attack the wolf which runs away downhill chased by the two males whose barking dies away. The female remains in the dump barking in the direction of the pursuit".

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