FOOD HABITS OF THE STONE MARTEN *MARTES FOINA* IN "LA MANDRIA" REGIONAL PARK (PIEDMONT REGION, NORTH-WESTERN ITALY)

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ABSTRACT – The diet of the stone marten (*Martes foina*) was studied by the analysis of 215 scats gathered during 1990 and 1991 in "La Mandria" Regional Park (north-western Italy). The results were expressed as percentage frequency of occurrence [F% = (number of occurrences of each food/number of scats) x 100] and relative percentage of frequency [Fr% = (number of occurrences of each food/total number of prey items) x 100]. Mammals were the predominant food category in each season (annual mean in Fr% = 60.5) and were mainly represented by rodents (Fr% = 44.8) and lagomorphs (Fr% = 15.4). *Myoxus glis* was the most preyed species (Fr% = 15.7) and its use was higher in autumn than in other seasons. Vegetables, mainly Rosaceae and Vitis vinifera fruits, were an important food resource in summer (Fr% = 41.1) and in autumn (Fr% = 17.2). Birds integrated the stone marten's diet mainly in winter (Fr% = 22.6), while insects were scarcely consumed throughout the year (Fr% = 4.3).

Key words: *Martes foina*, Stone marten. Food, Trophic niche, NW Italy.

RIASSUNTO – *Alimentazione della faina* Martes foina *nel Parco regionale "La Mandria" (Torino)* – La dieta della faina (*Martes* foina) è stata studiata analizzando 215 feci raccolte negli anni 1990-91 nel Parco Regionale "La Mandria" (Italia nord occidentale). I risultati ottenuti sono stati espressi come frequenza percentuale [FQ = (numero di presenze di una componente alimentare/numero delle feci esaminate) x 100] e frequenza relativa percentualc [Fr% = (numero di presenze di una cornponente alimentare/numero totale di componenti alimentari rinvenute) x 100]. I mammiferi, rappresentati soprattutto da roditori (Fr% = 44,8) e lagomorfi (Fr% = 15,4), sono risultati la categoria alimentare piu importantc in ogni stagione (media annuale della Fr% = 60,5). *Myoxus glis* è risultata la specie più predata con un consumo piu clcvato in autunno rispetto alle altre stagioni. I vegetali, rappresentati soprattutto da frutti delle Rosaceae e da Vitis *vinifera*, Sono particolarmcntc importanti in estate (Fr% = 41,1) e secondariamente in autunno (Fr% = 17,2). Gli uccelli costituiscono una risorsa integrativa della dicta invernale (Fr% = 22,6), mentre gli insetti sono scarsamente consumati nel corso dell'anno (Fr% = 4,3).

Parole chiave: *Martes foina*, Faina, Alimcntazione, Niccliia trofica, Italia nord occidentale.

INTRODUCTION

The stone marten (*Martes foina*) diet has been extensively studied in Europe (e.g. Waechter, 1975; Delibes, 1978; Amores, 1980; Kalpers, 1983; Skirnisson, 1986; Labrid, 1987; Marchesi et al., 1989). In Italy, the research on this subject has advance in the last years (Pozio & Gradoni, 1981; Bertolino & Dore, 1991; De Marinis & Agnelli, 1992; Lucherini & Crema, 1993; Serafini & Lovari, 1993).

The discover of some resting sites of the stone marten, in farmsteads of "La Mandria" Regional Park (Piedmont region, north-western Italy), allowed to start a two-year investigation on feeding habits of this mustelid using faecal analysis method.

STUDY AREA

The research was carried out in "La Mandria" Regional Park (1344 ha), located between 45° 8' and 45° 14'N and 4" 50' and 4" 57' W. The area was a highland, with altitude varying from 258 to 402 m a.s.l. About half of the surface (684 ha) was a wood of *Querco-Carpinetum* in degraded condition (A.I.N., 1980; I.P.L.A., 1984). The remaining part was a pasture for extensive livestock. Some farmsteads, a hare and pheasant farm and structures for public use were also present.

METHODS

From January 1, 1990 to December 31, 1991 scats were collected, twice a month, in 6 farmsteads used by stone martens as resting sites. They were broken up in hot water, and washed in a tea-sieve (1.3 mm mesh). Mammals hairs, cleaned with ethanol, were identified using a light microscope, on the basis of characteristics of medulla and cuticular scale patterns (Day, 1966; Debroit et al., 1982; Bounous et al., 1990). For the identification of birds, Day (1966) and Brom (1986) keys were used. **A** collection of reference material for mammals, birds, fruits and insects was also used. Only vegctablcs representing an effective food resource for stone martens were considered. Small vegetable residues were fairly frequently found in scats (Fr% 23.1) but, as reported for other carnivores (Prigioni, 1991), their ingestion seemed unrclatcd with thc feeding habits of the stone marten

According to Prigioni (1991) data were expressed as: i) number of scats containing a specific taxon (N), ii) percentage frcqucncy of occurrence [F% = (number of occurrences of each food item/number of scats) x 100], and iii) relative percentage of frequency [Fr% = (number of occurrences of each food item/total number of prey items) x 100].

The trophic niche breadth was evaluated by thc Lcvins' index (Feinsinger et al., 1981):

$$B = 1/R\sum pi^2$$

where R is the number of food categories (the components of the diet were grouped in: Insectivores, Lagomorphs, Rodents, Birds, Reptiles, Insects, Vegetables and Eggs) and pi is the relative percentage of frcqucncy of each food items. B index ranges from $1/R$, when the species uses only one food item, to 1, when all categories are equally used.

To test the seasonal differences in the use of the main food items, χ^2 test for independent samples was performed.

RESULTS AND DISCUSSION

We collected a total of 215 scats: 128 in 1990 and 87 in 1991. The overall diet of the stone marten is summarized in Tab. 1. Mammals, mainly rodents (Fr% = 44.8 and 74% of the preyed mammals) and lagomorphs (Fr% = 15.4) were the predominant food categories followed by vegetable fruits. Birds were an important integrative food of the diet (Fr% = 22.6). On the other hand insects were scarcely used and reptiles and eggs were occasionally preyed on.

Tab. 1 – Composition of the stone marten's diet recorded in 1990-91 (N = number of scats containing a specific taxon; F% = percentage frequency of occurrence; Fr% = relative percentage of occurrence).

	N	F%	Fr%
VEGETABLES	66	28.84	22.07
Moraceae	10	4.65	3.34
Ficus carica	10	4.65	3.34
Rosaceae	22	10.23	7.36
Prunus avium	6	2.79	2.01
Rubus sp.	9	4.19	3.01
Rosa canina	4	1.86	1.34
Malus donzestica	3	1.39	1.00
Vitaceae	33	15.35	11.04
Vitis vinifera	33	15.35	11.04
Cornaceae	1	0.46	0.33
Cornus mas	1	0.46	0.33
INSECTS	13	5.12	4.35
Dermaptera	1	0.46	0.33
Coleoptera	5	1.86	1.67
Silfidae	1	0.46	0.33
Carabidae	1	0.46	0.33
Geotrupidae	1	0.46	0.33
Undetermined Coleoptcra	2	0.93	0.67
Hymenoptera	4	1.86	1.34
Apoidea	1	0.46	0.33
Vespoidea	2	0.93	0.67
Undetermined Hymenoptera	1	0.46	0.33
Undetermined Insects	3	1.39	1.00
REPTILES	2	0.93	0.66
Squamata	2	0.93	0.66
Lacerta viridis	1	0.46	0.33
Squamata undeterminated	1	0.46	0.33
BIRDS	36	16.74	12.04
Passeriformes	31	14.42	10.37
Columbiformes	5	2.32	1.67
MAMMALS	181	79.07	60.53
Insectivora	1	0.46	0.33
Talpa sp.	1	0.46	0.33
Lagomorpha	46	21.40	15.38
Rodentia	134	58.60	44.82
Gliridae	51	23.72	17.06
Myoxus glis	47	21.86	15.72
Muscardinus avellanarius	4	1.86	1.34
Microtidae	43	20.00	14.38
Clethrionomys glareolus	27	12.56	9.03
Microtus savii	4	1.86	1.34
Arvicola terrestris	8	3.72	2.68
Undetermined Microtidae	4	1.86	1.34
Muridae	40	18.60	13.38
Rattus sp.	2	0.93	0.67
Apodemus sp.	35	16.28	11.70
Mus nzusculiis domesticus	3	1.39	1.00
EGGS	1	0.46	0.33
Number of scats		215	
Number of prey items		299	

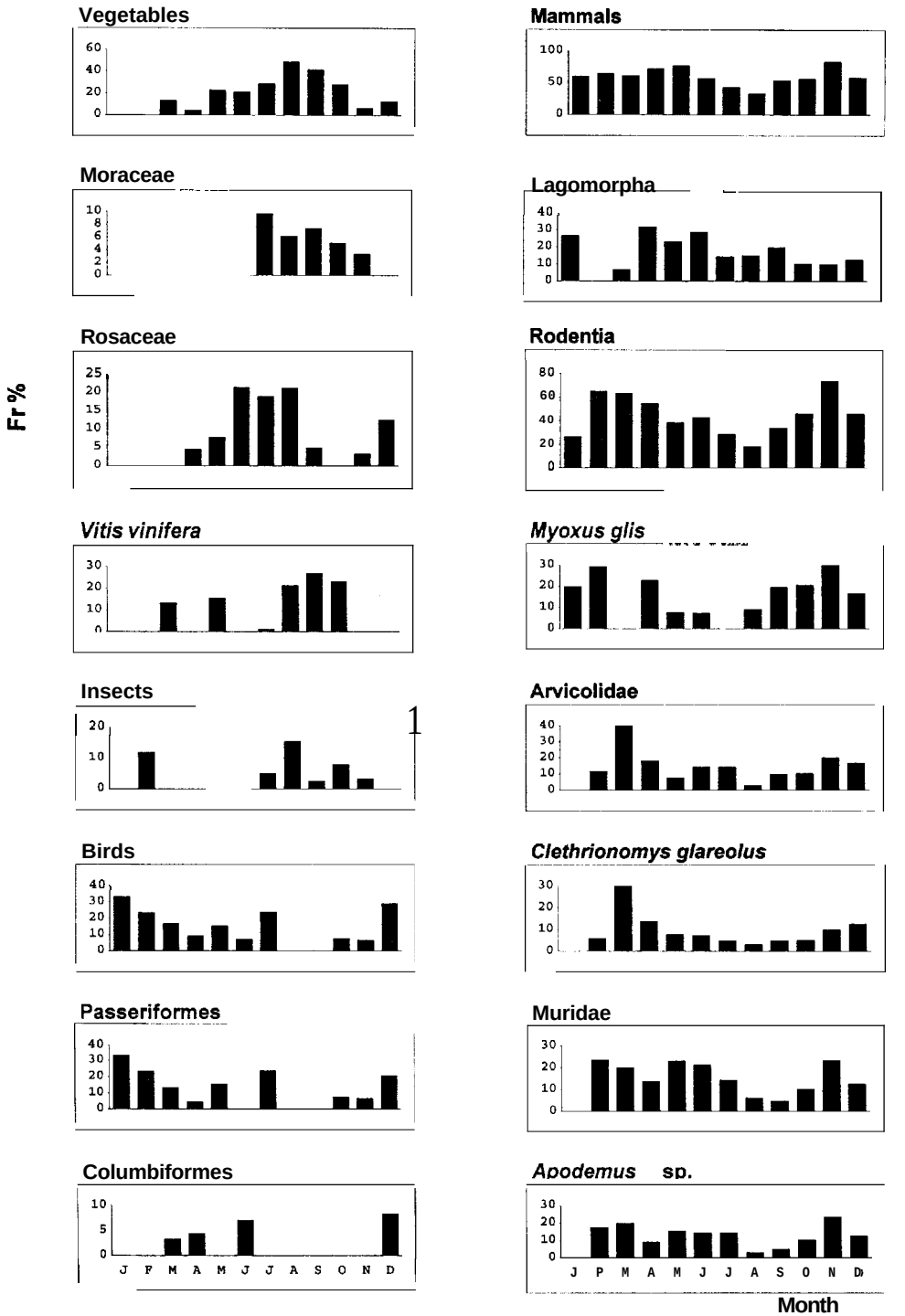

Fig. 1 – Percentage of occurrence of food items throughout the study period. Monthly scat sample size: J=9; F=12; M=21; A=20; M=11; J=14; J=15; A=16; S=35; O=17; N=21; D=24.

The annual variation in use of the main food items is shown in Fig. 1. Mammals were preyed all year round with peaks in spring and in late autumn. Rodents also followed this pattern, while lagomorphs were more preyed on in spring. Among rodents *Myoxus glis* was mostly eaten in autumn and in winter, when Arvicolidae occurred in low proportion in the diet. Vegetables, mainly Rosaceae and Vitaceae fruits, were an important food resource especially in summer. Birds, mostly Passeriformes, were mainly eaten at the beginning of summer and in winter. Insect were regularly consumed in summer.

Significant seasonal variation in the stone marten diet was found for vegetables and Gliridae (Tab. 2). This last food item, almost exclusively *Myoxus glis*, was more used in autumn than in other seasons.

The annual trophic niche breadth was relatively low (1990: B = 0.39; 1991: B = 0.48; 1990/91: B = 0.43). B varied little throughout the year with a peak in July and minimum values in November and February (Fig. 2). It was the lowest when more than 60% of the stone marten diet was represented by rodents.

The stone marten is considered **a** generalist and opportunistic predator. Its diet varies locally and seasonally depending on food availability (e.g. Libois & Waechter, 1991). This evidence also occurred in our study area where mammals and fruits were the most exploited items. Among mammals, the dormouse was an optimal food in autumn and winter, when it accumulates fat reserve for hibernation. Its hibernation nests seem to be particularly exposed to the predation because they are frequently located in hay-lofts around the farmsteads where resting sites of stone martens usually occurred. No evidence of so high predation on dormice was reported in literature. A similar consideration can be done about lagomorphs, excluding the study by Sebela (1982) in which they wcrc the dominant food item.

Tab. 2 – Significance levels of the x^2 test obtained by the comparison between seasons of the mean frequency of occurrence of some food items. **Sp** = **Spring:** Su = Summer: **Au** = Autumn. Wi = winter.

CATEGORIES	SP-SU	SP-AU	SP-WI	SU-AU	SU-WI	AU-WI	SP-SU-AU-WI
Lagomorpha	ns	ns	ns	ns	0.05	ns	ns
Gliridae	ns	0.01	ns	0.05	ns	0.05	0.01
Microtidae	ns	ns	ns	ns	ns	ns	ns
Muridae	ns	ns	ns	ns	ns	ns	ns
Birds	ns	ns	0.05	ns	0.05	ns	ns
Vegetables	0.001	ns	ns	0.01	0.001	0.001	0.001

In our study area lagomorphs could be mainly represented by rabbits (*Oryctolagus cuniculus*) which are more abundant than hares (*Lepus capensis*). The predation on game birds was negligible or absent.

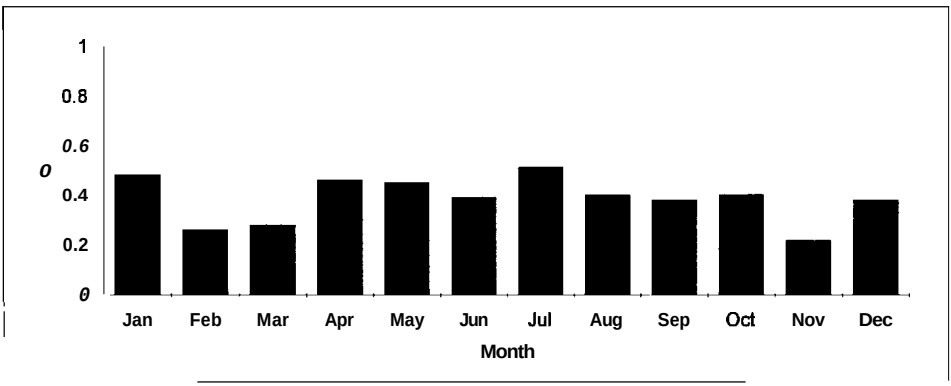

Fig. 2 – Monthly variation of the trophic niche breadth (B) throughout the year. Data of 1990 and 1991 pooled.

Fruits were particularly exploited in summer because were abundant and easily accessible with a low energetic effort by the stone marten.

Contrary to other studies (e.g. Waechter, 1975; Marchesi et al., 1989; Serafini and Lovari, 1993), insects were not an important resource.

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