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INVESTIGATING ANIMALS' RENEWABLE BIOMASS USING A TREE-FITTING MODEL

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ABSTRACT

Animals' overlapping food chains influence the amount of energy – biomass that moves from one feeding level to the next. Dietary habits of red fox (*Vulpes vulpes*) and stone marten (*Martes foin*a) were studied in central Greece, using microscopic stomach analysis. Frequency of occurrence (FO) and relative volume (RV) were quantified. In order to study food niche overlap between two carnivores, the classical Pianka's index method and an alternative method of tree analysis were compared. Both methods showed a seasonal overlap, provided that RV was used in tree analysis as an influence variable.

Keywords: classification trees; diet; *Martes foina*; overlap; *Vulpes vulpes*.

INTRODUCTION

Biomass is a scientific expression for living matter, but the term biomass is also utilized to denote yield derived from living organisms - timber from trees, crops, vegetation parts and residues such as twigs, stems and leaves, as well animal wastes. All the Earth's biomass exists in a thin exterior level called the biosphere. This represents only a tiny part of the total mass of the soil, but constitutes an enormous stock of energy - as fuel and as food. More significantly, it is a stock which is being replaced – renewed persistently.

The trophic level of an organism is the place it engages on the food chain. Food chains start at trophic level 1 with primary producers, move to herbivores at level 2, predators at level 3 and typically finish with carnivores or apex predators at level 4 or 5. The path along the chain forms a one-way flow, where energy moves in the form of food.

In genuine world ecosystems, there is more than one food chain for most organisms, since most organisms consume more than one kind of food or are eaten by more than one kind of predator. The complicated network of crossing and overlapping food chains for an ecosystem is called its food web.

Red fox (*Vulpes vulpes* L.) and stone marten (*Martes foina* L.) are most common and abundant predatory animals in Greece (Vlachos *et al*. 2006). Some studies on feeding habits of these predatory animals in Greece were carried out by Vlachos *et al*. (2006), Vlachos *et al*. (2007), Papakosta *et al*. (2010), Vlachos *et al*. (2010), Bakaloudis *et al*. (2012), whereas there are numerous studies about feeding and niche overlap in different parts of Europe both on red fox (Serafini and Lovari 1993; Kauhala *et al*. 1998; Leckie *et al*. 1998; Lanszki *et al*. 1999; Carvalho and Gomes 2004; Santos *et al*. 2004) and on stone marten (Serafini and Lovari 1993; Clevenger 1994; Padial *et al*. 2002; Virgos and Garcia 2002; Carvalho and Gomes 2004; Santos *et al*. 2007).

For the type of landscape in central Greece, a great diversity of relief formations, water supplies, land and flora is typical. The shredded relief specifies a mixture of microclimatic and hydrological conditions, and a mosaic structure of biotopes. Small-size broad-leafed forests endure combined with cultivable farms, pasturelands, hayfields, and villages. Both red fox and stone marten are abundant and characteristic for this landscape, where they habituate diverse biotopes. In 2005, in the studied area the density was 0.4±0.23 ind./20 km for red fox and 0.05±0.09 ind./20 km for stone marten (Vlachos *et al*. 2006).

The aim of this study was to evaluate dietary overlap of red fox and stone marten in central Greece, by comparing tree analysis to another standard method. Classification trees are directed graphs beginning with one node and branching to many, to predict a categorized variable, and they are fundamental to computer science, biology, psychology, and many other fields (Kass 1980).

MATERIAL AND METHODS

The research was conducted in Fthiotida prefecture, in central Greece (38°44'-38°59'N; 22°02'-22°37E). The study area covered 495.181 ha, where arable lands, pastures-adjacent meadows and oak forests predominated (56.17%, 28.33% and 14.59%, respectively).

The diet of red fox and stone marten was studied by microscopic stomach analysis. During three years (2003-2005), 219 stomachs of foxes and 109 stomachs of martens were collected in different seasons. Seasons were distinguished according to accessibility of resources and feeding specialities of predators: summer (July-September), autumn (October-November), winter (December-March) and spring (April-June). Carcasses of foxes and martens were collected on forest roads and at breeding dens (causes of death and health status were unknown). Analysis of stomachs followed the standard procedure (Stains, 1958). Food items were classified into 57 and 42 categories, for red fox and stone marten respectively (Tables 1 and 2). All food categories were grouped into 6 diet groups: mammalia, aves, reptilia-amphibia, insecta, planta and waste (waste means human left wastes).

Nutrient composition was defined with the frequency of occurrence (FO) - the percentage of samples in which a given nutrient item occurred and in relative volume (RV) of each sort of food consumed by predators.

Niche overlap was measured through Pianka's index (Krebs 1998):

$$O_{jk} = \frac{\sum_{i}^{n} p_{ij} p_{ik}}{\sqrt{\sum_{i}^{n} p_{ij}^2 \sum_{i}^{n} p_{ik}^2}}$$

where O_{jk} is Pianka's measure of niche overlap between species *j* and *k*; p_{ij} (or $p_{ik)}$ is the proportion of the food category *i* recorded in the diet of the species *j* (or *k*); *n* is the total number of food categories. Pianka's indices were compared to a classification tree (Kass 1980), where "diet group" (6 groups) was used as dependent variable and "season" (4 seasons) and "predator" (2 predators) were used as independent variables. Frequency of occurrence (FO) and relative volume (RV) were used as influence variables.

RESULTS - DISCUSSION

Red fox diet. A detailed description of red fox diet is given in Table 1. Seeing the primary nutrient elements, as reported, the diet of red fox could be split into two periods: 1) summer and autumn - when vegetation and mammals are most significant; 2) winter and spring – when mammals were specified as the basic nutrient. In summer and autumn, *Lepus europaeus* and *Rattus rattus* were most frequently used among mammals (13.7% and 10.62% RV, respectively). The relative volume of plants reached 33.91-44.59% (mainly *Pyrus amygdaliformis*). Insects were a significant prey in summer time (24.6% RV). The frequency of bird occurrence reached high values, with relative volume that exceed 15%. In winter-spring time the main nutrient resources were small rodents (mainly *Rattus rattus*, 11.48-13.33% RV). In spring, 23.28% of relative volume was made by *Sus scrofa*. All other nutrient elements were ate in small quantities and didn't have any significance.

In numerous studies small mammals are specified as the basic nutrient for red fox (30.80% FO, up to 50% RV and 55% consumed biomass) the whole year (Cavallini and Volpi 1995; Jedrzejewksi and Jedrzejewska 1992; Jedrzejewska and Jedrzejewski 1998; Kauhala *et al*. 1998; Leckie *et al*. 1998). Vegetation as the main nutrient resource (over 50% RV) in summer-autumn diets is typical of southern latitudes (Serafini and Lovari 1993).

Stone marten diet. A detailed description of stone marten diet is given in Table 2. The marten diet, agreeing to the primary nutrient elements, can be split into two periods: the first, spring, when mammals prevailed, and the second, summer-autumn-winter, when plants were defined as the staple food. In spring, the stone marten diet consisted mostly of small rodents (30.28% RV; mainly *Apodemus mystacinus*). In summer-autumn-winter time, plants were having 56.10-70.54-43.92% RV, respectively (Table 2). As a seasonal nutrient in this period, birds were significant in winter (29.01% RV). Additional nutrient elements were ate in small quantities. In many studies on stone marten, forest rodents were also important. Stone marten consume large amounts of birds in warm season, too (Serafini and Lovari 1993; Clevenger 1994; Padial *et al*. 2002; Virgos and Garcia 2002).

Food niche overlap. According to Pianka's index (Table 3), there is a high food niche overlap between the two predators, whereas the widest values were founded in spring and autumn (0.92). The niche overlap calculated by Pianka's index (0.67-0.92) was quite wide as compared with the outcomes derived from analogous reports (Jedrzejewska and Jedrzejewski 1998; Santos *et al*. 2007).

As for the method of classification trees that was applied to our data, with "diet group" (6 diet groups: mammalia, aves, reptilia-amphibia, insecta, planta and waste) as dependent variable, "season" (4 seasons: spring, summer, autumn, winter) and "predator" (2 predators: red fox and stone marten) as independent variables, we noticed the following: When frequency of occurrence (FO) was used as influence variable, "season" was not included in the tree-fitting model. However, when relative volume (RV) was used as influence variable, "season" was the only independent variable included in the model. In other words, "season" was the best predictor of «diet group». The chi-square value, degrees of freedom (df), and significance level (p-value) are displayed for the split in Figure 1. For most practical purposes, we will likely be concerned solely in the significance level, which is zero for the split; therefore tree model was statistically significant. According to the nodes formatted, seasonal food niche overlap of the two predators could be divided into two periods: 1) spring and summer - when insects, plants and mammals are most important; 2) winter and autumn – when the same diet groups were defined as the staple food, in a slightly different order (plants, insects and mammals).

The risk and classification statistics allow us to have a fast assessment of how well the model fits. The risk estimate of 0.722 (with standard error 0.032) indicates that the diet group predicted by the model is wrong for 72.2% of the cases. Hence, the risk of misclassifying a diet group is about 72%. The results in the classification table are logical considering the risk estimate. Table 4 indicates that the model assorts about 27.8% of the diet groups correctly. Nevertheless, the classification table does display one possible advantage with this model: for mammals and plants, it predicts a good rating (47.9% and 54.4%, respectively), which means that 47.9% of mammals and 54.4% of plants are accurately classified with the diet groups.

Cross-validation permits us to evaluate how well our tree structure extrapolates to a bigger population. The risk estimate of 0.722 (with standard error 0.032) is identical to the risk estimate from the training sample; hence we can characterize our model as valid.

Table 1. Diet composition of red fox split to season (FO: Frequency of Occurrence, %, RV: Relative Volume, %), 2003-2005.

	Spring		Summer		Autumn		Winter		Total	
	FO	**RV**	**FO**	**RV**	**FO**	**RV**	**FO**	**RV**	**FO**	**RV**
MAMMALIA		**65.28**		**26.43**		**28.74**		**63.33**		**45.78**
Lagomorpha		**5.94**		**13.70**		**3.66**		**15.16**		**9.01**
Lepus europaeus	29.51	5.94	32.50	13.70	27.59	3.66	35.00	15.16	**31.05**	**9.01**
Rodentia		**19.32**		**9.62**		**13.42**		**23.85**		**16.63**
Apodemus flavicolis	6.56	2.09	2.50	0.81	1.72	0.00	0.00	0.00	**2.74**	**0.69**
Apodemus mystacinus	4.92	7.55	2.50	0.00	1.72	0.00	10.00	4.93	**5.02**	**3.09**
Glis glis	0.00	0.00	0.00	0.00	1.72	1.27	1.67	4.72	**0.91**	**1.51**
Micromys minutus	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	**0.46**	**0.00**
Mus musculus domesticus	0.00	0.00	5.00	4.48	3.45	1.54	0.00	0.00	**1.83**	**1.38**
Rattus rattus	11.48	9.68	12.50	4.33	18.97	10.62	13.33	14.20	**14.16**	**9.96**
Sciurus vulgaris	0.00	0.00	0.00	0.00	3.45	0.00	0.00	0.00	**0.91**	**0.00**
Insectivora		**9.37**		**0.00**		**4.84**		**5.34**		**5.13**
Crocidura leucodon	1.64	1.63	5.00	0.00	6.90	1.50	10.00	4.25	**5.94**	**1.88**
Crocidura suaveolens	6.56	7.75	0.00	0.00	5.17	3.34	3.33	1.09	**4.11**	**3.25**
Carnivora		**3.13**		**0.10**		**2.94**		**4.14**		**2.70**
Felis silvestris	3.28	0.00	0.00	0.00	1.72	0.00	0.00	0.00	**1.37**	**0.00**
Martes foina	9.84	0.00	15.00	0.00	18.97	0.00	6.67	0.00	**12.33**	**0.00**
Meles meles	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.46**	**0.00**
Mustela nivalis	13.11	3.13	15.00	0.10	15.52	1.67	8.33	0.15	**12.79**	**1.36**
Mustela putorius	6.56	0.00	10.00	0.00	10.34	1.00	5.00	3.99	**7.76**	**1.25**
Vulpes vulpes	0.00	0.00	0.00	0.00	1.72	0.00	0.00	0.00	**0.46**	**0.00**
Unknown	0.00	0.00	0.00	0.00	1.72	0.27	0.00	0.00	**0.46**	**0.08**
Artiodactyla		**24.60**		**3.02**		**3.87**		**6.56**		**9.61**
Capreolus capreolus	6.56	0.00	7.50	0.00	5.17	0.00	3.33	0.00	**5.48**	**0.00**
Cervus elaphus	1.64	0.00	0.00	0.00	1.72	0.00	5.00	0.00	**2.28**	**0.00**
Ovis aries	3.28	1.32	0.00	0.00	0.00	0.00	0.00	0.00	**0.91**	**0.34**
Sus scrofa	11.48	23.28	22.50	3.02	12.07	3.87	6.67	6.56	**12.33**	**9.27**
Unknown	**8.20**	**2.91**	**0.00**	**0.00**	**5.17**	**0.00**	**8.33**	**8.28**	**5.94**	**2.71**
AVES		**5.90**		**7.17**		**4.73**		**15.87**		**8.17**
Birds	16.39	5.90	10.00	7.17	22.41	4.68	23.33	15.87	**18.72**	**8.16**
Egg	0.00	0.00	0.00	0.00	1.72	0.05	0.00	0.00	**0.46**	**0.02**
REPTILIA-AMPHIBIA		**3.68**		**4.41**		**0.13**		**0.73**		**2.04**
Lacerta viridis	3.28	0.26	0.00	0.00	1.72	0.13	1.67	0.15	**1.83**	**0.14**
Lizard	8.20	1.87	5.00	0.18	0.00	0.00	5.00	0.28	**4.57**	**0.58**
Snake	1.64	1.12	5.00	4.03	0.00	0.00	0.00	0.00	**1.37**	**1.10**
Turtle	1.64	0.24	0.00	0.00	0.00	0.00	0.00	0.00	**0.46**	**0.06**
Unknown	0.00	0.00	0.00	0.00	1.72	0.00	1.67	0.30	**0.91**	**0.07**
Frog	1.64	0.18	2.50	0.20	0.00	0.00	0.00	0.00	**0.91**	**0.09**

INSECTA		**12.76**		**24.60**		**10.71**		**5.70**		**12.85**
Araneae	0.00	0.00	2.50	0.05	0.00	0.00	0.00	0.00	**0.46**	**0.01**
Coleoptera	18.03	2.97	22.50	0.45	6.90	0.20	13.33	1.46	**14.61**	**1.25**
Diptera	1.64	0.02	0.00	0.00	1.72	0.10	1.67	0.06	**1.37**	**0.05**
Embioptera	11.48	1.00	2.50	1.51	1.72	0.08	5.00	0.69	**5.48**	**0.75**
Hemiptera	0.00	0.00	2.50	0.05	0.00	0.00	0.00	0.00	**0.46**	**0.01**
Hymenopterae	4.92	0.04	2.50	0.00	3.45	0.03	0.00	0.00	**2.74**	**0.02**
Isopoda	29.51	2.82	12.50	1.08	3.45	0.27	11.67	1.69	**14.61**	**1.42**
Lepidoptera	26.23	2.31	22.50	6.07	8.62	1.40	25.00	1.66	**20.55**	**2.64**
Mecoptera	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.46**	**0.00**
Neuroptera	1.64	0.06	0.00	0.00	1.72	0.00	0.00	0.00	**0.91**	**0.02**
Orthoptera	11.48	0.74	45.00	10.21	31.03	6.88	1.67	0.09	**20.09**	**4.38**
Polydesmida	18.03	2.70	35.00	5.18	31.03	1.74	1.67	0.04	**20.09**	**2.28**
Unknown	1.64	0.10	0.00	0.00	0.00	0.00	0.00	0.00	**0.46**	**0.03**
PLANTA		**7.47**		**33.91**		**44.59**		**6.03**		**23.82**
Achyranthus sp.	0.00	0.00	5.00	2.06	1.72	0.30	0.00	0.00	**1.37**	**0.51**
Actinidia polygama	0.00	0.00	0.00	0.00	1.72	3.11	0.00	0.00	**0.46**	**0.95**
Amygdalus communis	0.00	0.00	5.00	0.10	0.00	0.00	1.67	0.04	**1.37**	**0.03**
Carica papaya	0.00	0.00	5.00	10.47	0.00	0.00	0.00	0.00	**0.91**	**2.12**
Hordeum sp.	1.64	0.08	0.00	0.00	0.00	0.00	0.00	0.00	**0.46**	**0.02**
Morus alba	1.64	0.08	0.00	0.00	1.72	0.07	1.67	0.15	**1.37**	**0.08**
Pyrus amygdaliformis	19.67	6.98	27.50	12.86	60.34	37.26	16.67	4.93	**31.05**	**16.94**
Pyrus pyraster	0.00	0.00	0.00	0.00	8.62	2.19	3.33	0.77	**3.20**	**0.85**
Triticum laevissimum	1.64	0.08	2.50	0.05	0.00	0.00	1.67	0.01	**1.37**	**0.03**
Vegetable remains	91.80	0.00	57.38	0.23	84.48	0.00	76.67	0.00	**84.93**	**0.05**
Vitis sılvestris	0.00	0.00	5.00	8.11	0.00	0.00	0.00	0.00	**0.91**	**1.64**
Zea mays	3.28	0.22	2.50	0.03	1.72	1.67	5.00	0.12	**3.20**	**0.60**
Fruit	1.64	0.02	0.00	0.00	0.00	0.00	0.00	0.00	**0.46**	**0.01**
WASTE	**55.74**	**4.92**	**35.00**	**3.47**	**39.66**	**11.10**	**46.67**	**8.34**	**45.21**	**7.33**

Table 2. Diet composition of stone marten split to season (FO: Frequency of Occurrence, %, RV: Relative Volume, %), 2003-2005.

	Spring		Summer		Autumn		Winter		Total	
	FO	**RV**	**FO**	**RV**	**FO**	**RV**	**FO**	**RV**	**FO**	**RV**
MAMMALIA		**41.89**		**11.31**		**18.41**		**12.53**		**19.47**
Lagomorpha		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**
Lepus europaeus	3.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.94**	**0.00**
Rodentia		**30.28**		**11.31**		**16.47**		**12.53**		**16.69**
Apodemus sylvaticus	0.00	0.00	3.23	2.07	0.00	0.00	0.00	0.00	**0.94**	**0.52**
Apodemus mystacinus	6.06	21.31	0.00	0.00	0.00	0.00	0.00	0.00	**1.89**	**4.34**
Glis glis	0.00	0.00	3.23	0.00	0.00	0.00	7.69	8.49	**2.83**	**2.83**
Micromys minutus	0.00	0.00	0.00	0.00	6.25	13.89	0.00	0.00	**0.94**	**2.96**
Clethrionomys glareolus	0.00	0.00	3.23	9.24	0.00	0.00	0.00	0.00	**0.94**	**2.31**
Rattus rattus	3.03	2.71	0.00	0.00	0.00	0.00	0.00	0.00	**0.94**	**0.55**
Microtus arvalis	6.06	6.26	0.00	0.00	6.25	2.58	3.85	4.04	**3.77**	**3.17**
Insectivora		**0.10**		**0.00**		**1.94**		**0.00**		**0.43**
Crocidura leucodon	0.00	0.00	6.45	0.00	0.00	0.00	0.00	0.00	**1.89**	**0.00**
Crocidura suaveolens	6.06	0.10	0.00	0.00	6.25	1.94	3.85	0.00	**3.77**	**0.43**
Artiodactyla		**11.50**		**0.00**		**0.00**		**0.00**		**2.34**
Ovis aries	9.09	11.50	3.23	0.00	0.00	0.00	0.00	0.00	**3.77**	**2.34**
Capra hircus	3.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.94**	**0.00**
AVES		**6.77**		**7.97**		**0.00**		**30.66**		**13.58**
Birds	6.06	6.77	12.90	7.28	6.25	0.00	19.23	29.01	**11.32**	**12.85**
Egg	6.06	0.00	9.68	0.69	0.00	0.00	7.69	1.66	**6.60**	**0.72**
REPTILIA-AMPHIBIA		**19.69**		**6.24**		**1.00**		**0.00**		**5.79**
Lacerta viridis	6.06	18.44	0.00	0.00	0.00	0.00	0.00	0.00	**1.89**	**3.76**
Podarcis muralis	0.00	0.00	0.00	0.00	6.25	0.00	0.00	0.00	**0.94**	**0.00**

Unknown snake	3.03	0.85	0.00	0.00	0.00	0.00	0.00	0.00	**0.94**	**0.17**
Unknown lizard	6.06	0.41	12.90	6.24	6.25	0.68	0.00	0.00	**6.60**	**1.79**
Rana graeca	0.00	0.00	0.00	0.00	6.25	0.32	0.00	0.00	**0.94**	**0.07**
INSECTA		**15.62**		**18.37**		**8.40**		**8.84**		**12.51**
Coleoptera	12.12	0.61	12.90	0.91	37.50	3.88	38.46	7.58	**22.64**	**3.70**
Hymenoptera	6.06	1.32	0.00	0.00	6.25	0.00	0.00	0.00	**2.83**	**0.27**
Lepidoptera	9.09	5.92	9.68	0.83	25.00	0.90	3.85	0.00	**10.38**	**1.61**
Orthoptera	15.15	5.28	45.16	14.93	43.75	2.00	7.69	0.32	**26.42**	**5.34**
Myriopoda	18.18	2.23	16.13	1.57	6.25	0.48	7.69	0.93	**13.21**	**1.26**
Trihoptera	0.00	0.00	0.00	0.00	6.25	0.32	0.00	0.00	**0.94**	**0.07**
Libellulidae	0.00	0.00	0.00	0.00	6.25	0.81	0.00	0.00	**0.94**	**0.17**
Arahnidae	3.03	0.00	3.23	0.00	0.00	0.00	0.00	0.00	**1.89**	**0.00**
Unknown	3.03	0.26	3.23	0.14	0.00	0.00	0.00	0.00	**1.89**	**0.09**
PLANTA		**13.46**		**56.10**		**70.54**		**43.92**		**46.44**
Hordeum sp.	0.00	0.00	3.23	0.00	0.00	0.00	0.00	0.00	**0.94**	**0.00**
Morus alba	0.00	0.00	38.71	32.46	0.00	0.00	0.00	0.00	**11.32**	**8.11**
Pyrus amygdaliformis	3.03	7.10	9.68	5.52	25.00	22.06	7.69	21.34	**9.43**	**14.64**
Vegetable remains	6.06	0.43	6.45	0.55	12.50	1.65	11.54	0.21	**8.49**	**0.65**
Vitis vinifera	0.00	0.00	6.45	8.55	31.25	41.02	3.85	8.29	**7.55**	**13.65**
Prunus sp.	0.00	0.00	6.45	0.61	6.25	2.10	0.00	0.00	**2.83**	**0.60**
Prunus spinosa	0.00	0.00	0.00	0.00	0.00	0.00	11.54	13.16	**2.83**	**4.38**
Fycus sp.	0.00	0.00	3.23	3.45	12.50	3.71	0.00	0.00	**2.83**	**1.65**
Rosaceae	3.03	0.85	0.00	0.00	0.00	0.00	3.85	0.02	**1.89**	**0.18**
Kiwi	3.03	5.07	0.00	0.00	0.00	0.00	0.00	0.00	**0.94**	**1.03**
Rubus sp.	0.00	0.00	3.23	2.07	0.00	0.00	0.00	0.00	**0.94**	**0.52**
Almonds	0.00	0.00	0.00	0.00	0.00	0.00	3.85	0.83	**0.94**	**0.28**
Unknown	0.00	0.00	12.90	2.90	0.00	0.00	3.85	0.08	**4.72**	**0.75**
WASTE	**18.18**	**2.58**	**0.00**	**0.00**	**37.50**	**1.65**	**19.23**	**4.04**	**16.04**	**2.22**

Table 3. Food niche overlap of red fox and stone marten (O_{jk}: Pianka's index).

Season	O_{jk}
Spring	0.923
Summer	0.672
Autumn	0.916
Winter	0.837
Total	0.897

Table 4. Classification of diet groups from the tree-fitting model.

Observed	Predicted						
	Mammalia	**Aves**	**Reptilia-Amphibia**	**Insecta**	**Planta**	**Waste**	**Percent Correct**
Mammalia	23	0	0	0	25	0	47.9%
Aves	5	0	0	0	5	0	0.0%
Reptilia-Amphibia	12	0	0	0	6	0	0.0%
Insecta	29	0	0	0	25	0	0.0%
Planta	26	0	0	0	31	0	54.4%
Waste	3	0	0	0	4	0	0.0%
Overall Percentage	50.5%	0.0%	0.0%	0.0%	49.5%	0.0%	27.8%

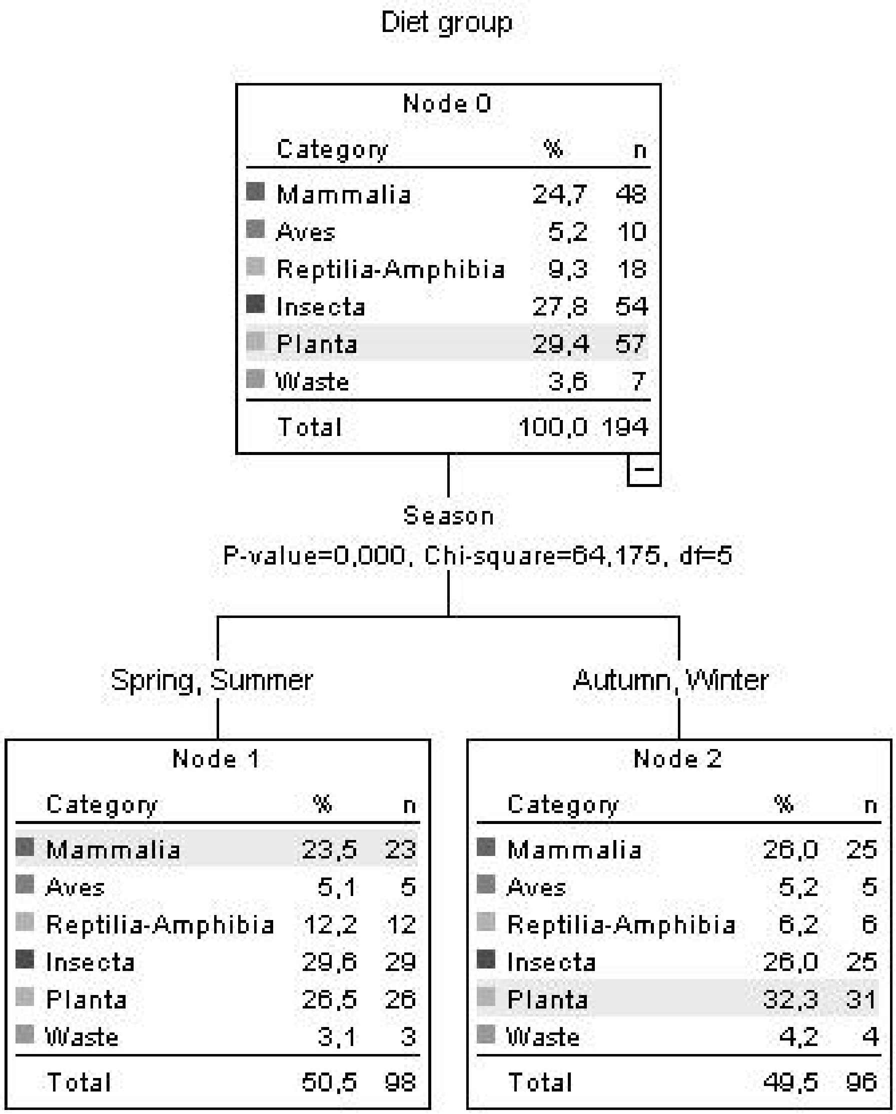

Figure 1. Tree-fitting model.

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