Small islands are typically characterised by simplified ecosystems with low levels of complexity and reduced biodiversity. This condition may determine a scarcity of food resources which in turn can affect several aspects of the ecological features of the species, particularly their trophic niche (e.g., Gorman, 1979; Stephen and Krebs, 1986; Pérez-Mellado and Corti, 1993).

Predators are extremely sensitive to the complexity and structure of their ecosystems, and lacertids, which are characterised by small size and generalist habits, usually get over the poverty of resources by in some cases adding vegetal material in their diet (Ouboter, 1981; Sorci, 1990; Pérez-Mellado and Corti, 1993; Van Damme, 1999). The Podarcis species inhabiting the Mediterranean islands are a quite well studied group concerning adaptation to island conditions (e.g., Ouboter, 1981; Valakos, 1987; Pérez-Mellado and Corti, 1993). The rich background on phylogeny (e.g., Lanza and Cei, 1977; Capula, 1990, 1994; Oliverio et al., 1998, 2000; Harris and Arnold, 1999) and autoecology (e.g., Valakos, 1987; Rugiero, 1994; Sorci, 1990; Pérez-Mellado and Corti, 1993; Bombi and Bologna, 2002) of these lizards has stimulated the use of this genus as a model for eco-ethological studies. Moreover, this group includes a high number of very common species (17 according to Oliverio et al., 2000), distributed on almost every small island of the Mediterranean basin: six Podarcis species are endemic to volcanic and continental Western and Eastern Mediterranean archipelagos (Oliverio et al., 2000); some other species are distributed on mainland areas and on the adjacent islands.

One of the less frequently studied species of this genus is Podarcis filfolensis (Bedriaga, 1876), endemic to the Maltese Archipelago and to the Linosa Island and the Lamponge Islet (Pelagie Islands) (Lanza, 1973; Turrisi and Vaccaro, 1998; Corti and Lo Cascio, 1999). The only ecological researches carried out on this species concern the trophic habits (Sorci, 1990) and the population structure (Di Palma, 1991; Scalera et al., 2004).

The aim of this paper is to describe the food habits of P. filfolensis during the dry season, the hardest period in the Mediterranean Basin.

Linosa Island (Agrigento Province) is situated in the Mediterranean Sea, about 150 km SW from Sicily, and 140 km E from Tunisia (between 35°51′07″N and 35°52′34″N, and 12°50′43″E and 12°52′34″E). From a geological point of view, it is a volcanic island, with a basaltic belt and inner tuffaceous formations (Agnesi and Federico, 1995). The climate is semi-arid (cfr. Agnesi and Federico, 1995 for a review); the vegetation is characterised by xerophilic Mediterranean maquis (Brullo and Piccione, 1985) and the main cultivations include vineyards, Indian figs, cereals and lentils.

Field research was carried out in the second week of June 2000. Captures were made in a sampling area of about half a hectare, in the middle of the island, where specimens were captured by hand, noosed, or by pitfall traps (filled with a small quantity of water to attract them). Ten pitfall traps (cylindrical polyethylene containers, 8.7 cm wide and
15.0 cm deep) were placed randomly in the study area leaning them against stones or walls, and frequently checked. Each captured lizard was sexed, measured, painted on the back for short-time identification (to avoid recaptures), and released. All the specimens collected (14 females and 22 males) were adults (SVL males: 53.9-69.1 mm; SVL females: 53.3-68.4 mm). Moreover, the stomach contents, obtained by stomach flushing, (e.g., Legler, 1977; Legler and Sullivan, 1979; Pietruszka, 1987; Fitzgerald, 1989; James, 1990; Fields et al., 2000; Bombi and Bologna, 2002) were collected. The specimens were kept some hours in captivity before the release, in order to verify if injury occurred. No cases of injury were observed and marked specimens were recovered some days after the stomach flushing. All food samples obtained were examined in the laboratory using a stereomicroscope; all the food items found were identified to the finest reachable taxonomic level, then photographed with a digital camera. Pictures of items were analysed by Image Tool 3.0 software (University of Texas Health Science Center in San Antonio) and measured, approximating their volume to that of a spheroid or of a cylinder, according to the item shape (e.g., Ouboter, 1981; Duhnahn, 1983; Valakos, 1987; Pérez-Mellado and Corti, 1993). The vegetable fragments appear in the stomach contents as dense sub-spherical masses, allowing to approximate their volumes to spheres. Items were grouped according to the most convenient taxonomic level (usually the order), and the food data were utilised to describe the food spectrum of P. filfolensis both in terms of prey taxa and of relative quantities (number and volume). Simpson diversity index (Simpson, 1949) was utilized in order to estimate the degree of predatory specialisation of both females and males (Rugiero, 1994; Capula and Luiselli, 1994; Capizzi et al., 1995; Filippi et al., 1996; Angelici et al., 1997; Pita et al., 2002). The graphical technique developed by Costello (1990), modified by Amundsen et al. (1996), was utilized to represent the feeding strategy of this species. In the Amundsen plot, frequency of occurrence of each food item is plotted against its prey-specific abundance, defined as the proportion a prey item (i) comprises of all prey items in only predators that contain prey (Amundsen et al., 1996). U test was used for statistical analysis. Cumulative-diversity curves (prey diversity plotted against number of stomachs) were elaborated for females and males to test whether the collected data were representative of the dietary spectrum of P. filfolensis and to avoid that intra-specific comparison could be biased by the effect of the sample size.

Five hundred and eighty-four items were recorded from the stomach contents examined. Five parasite cestoid specimens were also collected. The ingesta were determined as belonging to 20 prey type categories; one case of cannibalism by a female on a juvenile lizard was also observed (table 1). Both for females and males the cumulative-diversity curves indicated that a plateau phase was reached and prey composition was reliably assessed (fig. 1).

### Table 1. Diet composition of male and female Podarcis filfolensis, expressed as volume (mm³) of ingested preys and as number of individuals of ingested preys.

<table>
<thead>
<tr>
<th>Prey category</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>total volume</td>
<td>n° of individuals</td>
</tr>
<tr>
<td>Acara</td>
<td>0.746</td>
<td>3</td>
</tr>
<tr>
<td>Araneae</td>
<td>10.907</td>
<td>6</td>
</tr>
<tr>
<td>Chilopoda</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Coleoptera</td>
<td>180.595</td>
<td>13</td>
</tr>
<tr>
<td>Collembopla</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diptera</td>
<td>7.991</td>
<td>10</td>
</tr>
<tr>
<td>Formicidae</td>
<td>468.639</td>
<td>71</td>
</tr>
<tr>
<td>Hemiptera</td>
<td>144.319</td>
<td>8</td>
</tr>
<tr>
<td>Heteroptera</td>
<td>122.567</td>
<td>2</td>
</tr>
<tr>
<td>Hexapoda</td>
<td>8.849</td>
<td>2</td>
</tr>
<tr>
<td>Homoptera</td>
<td>52.401</td>
<td>56</td>
</tr>
<tr>
<td>Hymenoptera</td>
<td>44.839</td>
<td>6</td>
</tr>
<tr>
<td>Lepidoptera</td>
<td>14.059</td>
<td>2</td>
</tr>
<tr>
<td>Odonata</td>
<td>46.111</td>
<td>1</td>
</tr>
<tr>
<td>Orthoptera</td>
<td>14.277</td>
<td>1</td>
</tr>
<tr>
<td>Podarcis</td>
<td>520.911</td>
<td>1</td>
</tr>
<tr>
<td>filfolensis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudoscorpions</td>
<td>3.247</td>
<td>4</td>
</tr>
<tr>
<td>Psocoptera</td>
<td>0.474</td>
<td>2</td>
</tr>
<tr>
<td>Thysonoptera</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>vegetal</td>
<td>485.207</td>
<td>2</td>
</tr>
<tr>
<td>material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>debris</td>
<td>85.829</td>
<td>412.829</td>
</tr>
</tbody>
</table>

Vegetal material consisted of fibres (70.7% of the whole volume of vegetal material), seeds (19.5%), stamens and other components (9.8%) of Asteraceae and Apiaceae (especially belonging to the genera Anthemis and Daucus).

Plants were eaten more often and in greater quantity by males (64.9% in volume) than females (21.9%), evidencing a certain degree of specialisation of males for herbivory (fig. 2). Indeed, the top right position of a food item in the Amundsen plot denotes a relative specialisation of the predator on this item. The volume of ingested vegetal material is significantly greater in males (U test vs. m: U = 33; P = 0.0191), and the trophic niche, with regards to the animal preys, is wider in females (Simpson’s index of individuals: cF = 4.306; cm = 2.719). Among the animal component, Formicidae, which were the dominant preys for both sexes, represented a greater percentage in males (50.3% in volume) than in
females (28.6%) (table 1). Debris represented a higher volume percentage of the stomach contents in males (7.4%) than in females (3.9%).

The previous ecological study on this species carried out by Sorci (1990) was limited to a general assessment of the trophic niche, analysed using data collected through a mixed sampling of both faecal and stomach contents. The food habits were compared to the availability of preys calculated on the basis of the taxonomical diversity of each group of invertebrates on Linosa Island, as cited by Zavattari (1960), therefore neglecting the real abundance of the species. Moreover indications on sampling season and sex of specimens were lacking. It is our opinion that, notwithstanding the good and updated knowledge concerning the arthropods fauna in Linosa (Massa, 1995), the only faunistical information does not permit to assess and to quantify the real availability of each prey.

According to our results, *P. filfolensis*, during the dry season, shows a generalist food strategy, eating animals belonging to several taxa and supplementing its diet with vegetal material. In fact, similarly to other insular populations of some congeneric species (Ouboter, 1981; Pérez-Mellado and Corti, 1993; Van Damme, 1999), this lacertid has a diet including a great vegetal component, as underlined also by Sorci (1990). Nevertheless, fibres and seeds of Asteraceae and Apiaceae, the most common vegetal items found in stomach contents, are scarcely energetic food, difficult to assimilate. The vegetal component of diet is evidently greater in males than in females, but it is still unknown why there was an inter-sexual difference in terms of vegetal-eating by lizards at the study area. As concerns animal preys, the trophic niche is wider in females than in males but in both sexes Formicidae represents the dominant prey. Feeding on ants is already known in both mainland and insular species of *Podarcis* (e.g., Sorci, 1990; Pérez-Mellado and Corti, 1993; Capula and Luiselli, 1994; Grbac et al., 1998; Carrettero et al., 2001; Bombi and Bologna, 2002). These social insects represent an easy prey also in the smaller islands, probably because, even if suffer, as other animal groups, the insularity effects of reduction in species number (e.g., La Greca and Sacchi, 1957), they maintain a great abundance of individuals. In particularly at Linosa Island, a small number of species was cited [13 (Mei, 1995), vs. 100 of Sicily (Poldi et al., 1995)], but all of them are rich in individuals (M. Bologna and R. Scalera, pers. obs.).
Figure 2. Amundsen plot illustrating the feeding strategy of females (A) and males (B) of *P. filfolensis*.
This study represents the first contribution on the trophic niche of *P. filfolensis* which uses a single sampling method, considering both food volume and prey diversity, and evidencing inter-sexual diet differences.

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