Lizards on small islands: A network analysis
Firben på små øer: En netværksanalyse

M.Sc. Thesis/Specialerapport

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ABSTRACT

Ecological network analysis can be used to study several ecological aspects such as food web structure, mutualistic plant-pollinator interaction and the transmission of infectious diseases. However, many networks are species based, which means that individuals in the network are considered to be identical. Several studies have shown that this might be wrong. Large individual variation in a population has been observed for many species and may be due to differences between each individual in sex, age, behavior, and size. This individual variation may affect the dynamic of a population both ecologically and evolutionarily and therefore downscaling from species level to individual level may be important when studying ecological aspects for an ecological community. In this study, the diet of the endemic lizard of the Balearic Islands, *Podarlis lilfordi,* was examined in an individual-based network analysis. This was carried out on two islets, Na Moltona and Na Guardis, south of Mallorca, for two years (two spring seasons, one summer season and two autumn seasons). The population's niche was expected to be determined by one of two mechanisms: that individuals would be as generalized as the population or that individuals would be more specialized than the population. Networks were made for all seasons, male individuals, female individuals, and juvenile individuals on both islets. The results showed that individuals on both islets were more specialized than their population. The all season network on Na Moltona was both nested and showed modularity. Individual body size varied much and may have been the driver of the nested pattern seen in the network. The all–season network on Na Guardis was non-nested, but showed modularity. The individual body size did not vary that much on this islet, with may be explained by the non-nested pattern of the network, due to the different monopolizing of food resources and then reduced intraspecific competition. The modularity seen on both islets emphasize the individual niche specialization, but the different modules could not be explained by grouping of individuals at same sex, age or size. Instead, the grouping seemed to be made up by a few males, some females and some juveniles, maybe genetically close related individuals, i.e. family groups restricted in space. In conclusion, the downscaling from species level to individual level when analyzing ecological aspects such as population niche width has been shown to be important. Individuals in a population differ and this individual specialization can have strong effects on the dynamics in their interacting networks.

Keywords: Social network analysis, individual specialization, population niche width, dietary analysis, nestedness, modularity, *Podarcis lilfordi*, the Balearic Islands

INTRODUCTION

The Balearic Islands

The formation of the Mediterranean Basin began around 150 million years ago when the African and European plates separated. For a long period the part, which is now known as Balearic Islands, was connected to the Iberian Peninsula in the south where they made up the north-eastern part of a mountain ridge (Vogiatzakis *et al.* 2008). First in the Upper Miocene (around 11.6 Ma to 5.3 Ma) the Balearic Islands became isolated (Pérez-Mellado and Corti 1993, Vogiatzakis *et al.* 2008, Blondel *et al.* 2010).

The Balearic Islands or Archipelago consist of 151 islands and islets including four large ones: Mallorca, Minorca, Ibiza, and Formentera. The biodiversity on the Balearic Islands is less diverse than on the Iberian mainland. This is typical for islands. However, the Balearics have a quite rich fauna and many endemic species, including both animals and plants (Vogiatzakis *et al.* 2008).

The climate on the Balearic Islands is more or less the same as the typical climate for the Mediterranean region. Spring and autumn are relatively short periods (Blondel *et al.* 2010), and the two main seasons are dry and hot (summer) and wet and mild (winter) (Pérez-Mellado and Corti 1993, Woodward 2009, Blondel *et al.* 2010). Snow are a seldom phenomenon except in the mountains (Blondel *et al.* 2010). The temperature in the Mediterranean region is typical over 0°C in winter and sometimes higher than 30°C in summer, but the temperature in the western Mediterranean (which include the Balearic Islands) are less extreme than temperatures in the eastern Mediterranean (Woodward 2009).

On the Balearic Islands, ten reptile species are found (Vogiatzakis *et al.* 2008, Blondel *et al.* 2010). Four of these are lizards and they all belong to the genus *Podarcis* (family: Lacertidae): *Podarcis lilfordi*, *P. pityusensis*, *P. sicula* and *P. perspicillata* (Vogiatzakis *et al.* 2008). The first two are endemic to the Balearic Islands and are only found on Mallorca and Minorca, and on Ibiza and Formentera, respectively (Vogiatzakis *et al.* 2008, Blondel *et al.* 2010).

Island biology

Overall islands can be divided into oceanic islands and continental islands. The oceanic islands have never been connected to a mainland, whereas the continental islands have. The continental islands are isolated pieces of landmass and therefore these islands contain a part of the biota from the landmass they once were connected to (Thornton 2007). However some divide islands into five categories; continents (e.g. Australia), oceanic islands, continental fragments, continental shelf islands and islands in rivers and lakes (Whittaker and Fernández-Palacios 2007). As earlier described the Balearic Islands were a part of a larger landmass and they would therefore be classified as continental fragments.

As for the Balearic Islands, islands in general often have few species compared to mainland, i.e. a lower species density, but instead they have more unique or endemic species (Whittaker and Fernández-Palacios 2007). Furthermore species on islands often vary from mainland species in several ways, which the insular syndrome describes. The insular syndrome consists of six characteristics: (1) species sorting, (2) population size, (3) niche enlargement, (4) territorial behavior and aggressiveness, (5) body size and (6) mobility and dispersal (Blondel *et al.* 2010).

The first point, the species sorting process, refers to the process by which species are "selected" to colonize an island, due to the fact that not all species are successful candidates. The process has been studied for some birds and it shows that small generalist species were the best colonizer candidates (Blondel *et al.* 2010), whether this is a general tendency or not is not totally clear.

Secondly, island populations often are larger than mainland populations (Losos 2009, Blondel *et al.* 2010). The classic explanation for this phenomenon is density compensation, in which the population size increases due to the release from interspecific competition (Blondel *et al.* 2010) and predators (Whittaker & Fernández-Palacios 2007, Losos 2009), and increased suitability of habitats (Whittaker & Fernández-Palacios 2007).

The third point refers to niche enlargement which typically is seen for many island populations due to the low species density (Blondel *et al.* 2010), which results in empty niches and thereby more habitats will be available for the species present on the island (Whittaker & Fernández-Palacios 2007). The species on the islands therefore often begin to occupy more niches and increase their spectrum of food items compared to mainland populations of close relatives (Blondel *et al.* 2010). This phenomenon is called ecological release (Whittaker & Fernández-Palacios 2007), and can also help to explain the higher population densities on islands (Blondel *et al.* 2010).

Change in social behavior has often been observed in reptiles, mammals and birds on islands compared to closely related mainland populations. This shift is connected to several changes associated with their territories: (1) on islands the territory of an individual is often reduced, (2) the overlap in territories will be greater (Whittaker & Fernández-Palacios 2007, Blondel *et al.* 2010), (3) the survival rate will often be higher for the individuals in the population due to more abundant resources and lowered predation and therefore individuals will have a tendency to show more acceptances of subordinates in their territories (Whittaker & Fernández-Palacios 2007), (4) individuals will have reduced situation-specific aggressiveness, and (5) they will abandon the defense of territories. These changes are explained by the trade-off between the costs of defense and the costs of reproduction (Whittaker & Fernández-Palacios 2007, Blondel *et al.* 2010).

Other changes are seen in island populations such as smaller clutch sizes, but with larger offspring (Whittaker & Fernández-Palacios 2007, Blondel *et al.* 2010), which would lower intraspecific competition, adaptation towards herbivory (Blondel *et al.* 2010), and loss of defense traits due to a lower competition and predation (Whittaker & Fernández-Palacios 2007), e.g. a change in color, camouflage level (Blondel *et al.* 2010) and body size (further described below). Due to a long period of isolation (Vogiatzakis *et al.* 2008) and the loss in defensive traits, island species can be vulnerable to introduced species (Whittaker & Fernández-Palacios 2007, Vogiatzakis *et al.* 2008), e.g. domestic animals introduced by humans, but also to other human activity such as hunting, farmer societies, permanent settlement (Vogiatzakis *et al.* 2008, Blondel *et al.* 2010) and tourism (Vogiatzakis *et al.* 2008). These factors can lead to change in population size, change in distribution or even extinction of some island species (Blondel *et al.* 2010). For instance it is recognized that the extinction of several lizard species on islands has been due to human-introduced predators like mongooses, rats, cats and dogs (Whittaker & Fernández-Palacios 2007).

The fifth point about body size is controversial among scientists (Blondel *et al.* 2010). The rule, called Foster's rule, says that large species become smaller (nanism) and small species become larger (gigantism) on islands (Whittaker & Fernández-Palacios 2007, Blondel *et al.* 2010), but not all scientists share this view (Blondel *et al.* 2010). For some species it has been observed that evolution of their body size on islands is influenced by the specific island, meaning that the body size evolves in response to the resources used (Whittaker & Fernández-Palacios 2007, Case & Schwaner 1993) and not according to other species because of the lowered level of pressure from competitors and predators on islands (Whittaker & Fernández-Palacios 2007). Case & Schwaner (1993) points out that lizards on an island may evolve a larger body size due to the higher availability of resources. Furthermore, the level of predation and competition from other species is lowered and may induce the population to reach a high density and thereby a higher intraspecific competition, which may favor selection for a larger body size. The evolution of larger body size in this situation may have its effect on males especially, but due to the sharing of the same genes between males and females (except the sex chromosomes), the female body size will also become larger (Case & Schwaner 1993). However, the nanism/gigantism is not seen for all species, which in some cases can be explained by factors like the human introduction of domestic animals, which may favor a specific body size. The individuals in a lizard population exposed to introduced predators become smaller because of a better survival rate for smaller individuals. This support the theory, that the reptiles most prone to extinction are those which a relatively large body size and those who have been isolated for a long period (Whittaker & Fernández-Palacios 2007).

The last point about mobility and dispersal refers to a reduction in size of morphological traits that may decrease the likelihood of the individuals of a population to disperse over a long distance. A classic example is the loss of the ability to flight in birds and some insects. Another but related example is the shortening of legs and tails in lizards which reduce their mobility. Changes in such morphological traits may occur due to the absence of predators and for energy-saving reasons (Blondel *et al.* 2010).

Networks

The study of interaction communities has a long history (Olesen *et al.* 2010). However, these have only recently been analyzed explicitly as networks (Elberling & Olesen 1999, Memmott 1999). Overall, networks can be divided into three main categories; (i) traditional food webs, which is the most familiar type of network, where the interactions between consumers and their resources are in focus (Ings *et al.* 2009, Stouffer 2010), (ii) host-parasitoid webs, which is a kind of food web with the focus on the interactions between parasitoids and their host, and (iii) mutualistic webs, which is focusing on pollination and seed dispersal (Ings *et al.* 2009). In fact, all species and their interactions together are one gigantic complex ecological network (Olesen *et al.* 2007, Genini *et al.* 2010, Verhoef & Morin 2010).

Two-mode ecological networks consist of nodes represent two interacting communities (Pires *et al.* 2011, Verhoef & Morin 2010), for example animal species and plant species. The links between the nodes connect interacting species. Such networks are species-based (Tur *et al*. in press). However, each species represents a population of conspecific individuals and basically, species do not interact, their individuals do. Many models assume that individuals of a particular species are identical (Bolnick *et al.* 2003), but in fact individuals differ (Bolnick *et al.* 2003, Araújo *et al.* 2011, Dall *et al.* 2012). The importance of down-scaling has been stressed by Ings *et al.* (2009), Olesen *et al.* (2010), Dupont *et al.* (2011) and Goméz *et al.* (2011). Individual variation affects the ecological and evolutionary dynamics of a population (Bolnick *et al.* 2003, 2011, Tinker *et al.* 2012, Wolf & Weissing 2012, Svanbäck & Bolnick 2005) in an ecosystem and to understand these processes you need to understand the ecological interaction network in that system (Vázquez *et al.* 2009).

Despite the importance of individual variation within natural populations for many ecological processes (Bolnick *et al.* 2003, 2011, Dall *et al.* 2012, Sih *et al.* 2012, Wolf & Weissing 2012), only few studies have been studying ecological interactions at the individual level using network theory as a tool (however, see Woodward & Warren 2007, Araújo *et al.* 2008, 2010, Fortuna *et al.* 2008, 2009, Perkins *et al.* 2009, Dupont *et al.* 2011, Goméz *et al.* 2011, 2012, Pires *et al.* 2011, Yvon-Durocher *et al.* 2011, Tinker *et al.* 2012). An individual-resource network is a two-mode network, meaning that it consists of two different kinds of node; one representing the individuals of a population and another representing the resources used by the different individuals (Pires *et al.* 2011, Tinker *et al.* 2012). The links between the nodes represent their interactions, as for the species-based network described above (Goméz & Perfectti 2012, Tinker *et al.* 2012).

Individual-based networks may be used as a platform in the study of niche width variation among conspecific individuals (Van Valen 1965, Roughgarden 1972, Ings *et al.* 2009, Dall *et al.* 2012). Niche width is the term, which is used to describe the variation in resource use in a population. A population with a low resource use has a narrow niche width and a population with a high resource use has a wide niche width. All individuals in a population vary from each other and therefore each individual represents a part of the overall resource use of the population (Roughgarden 1972). The variation between individuals in a population can be their sex, age, shape, size, social status and behavior, which may lead to variation in resources use (Bolnick *et al.* 2003, 2011, Araújo *et al.* 2008, 2011, Pires *et al.* 2011, Dall *et al.* 2012). The variation in resource use by different individuals in a population can be described by optimal diet theory (ODT) (Bolnick *et al.* 2003, Svanbäck & Bolnick 2005, 2007, Araújo *et al.* 2008, 2011, Pires *et al.* 2011, Tinker *et al.* 2012,). The theory predicts that individuals attempt to maximize their energy input by using the resources, which give them the largest rate of energy intake, when search and handling times (capture of resource, consumption and digestion) also are taken into account (Bolnick *et al.* 2003, Svanbäck & Bolnick 2005, 2007, Araújo *et al.* 2011, Pires *et al.* 2011, Tinker *et al.* 2012). An individual's phenotypic traits are a complex factor that determines the individual niche width according to the theory, but also the diversity of available resources and resources abundance (Tinker *et al.* 2008, Araújo *et al.* 2011, Svanbäck *et al.* 2011) and intra- and interspecific competition may be important determining factors (Svanbäck & Bolnick 2005, 2007, Fontaine *et al.* 2008, Bolnick *et al.* 2010, Tinker *et al.* 2012).

Network analysis can be used to study several ecological aspects (Dormann *et al.* 2009, Dupont *et al.* 2009, Goméz *et al.* 2011) such as the transmission of infectious diseases (Perkins *et al.* 2009), food webs, mutualistic plant-animal interactions and more recently it has been used to study the interactions between individuals in a population (Goméz *et al.* 2011, Pires *et al.* 2011) for instance in relation to use of resources (Pires *et al.* 2011, Tinker *et al.* 2012, Wolf & Weissing 2012).

This study focuses on the diet of the Balearic lizard *Podarcis lilfordi* (Lacertidae) from the two Mallorcin islets, Na Moltona and Na Guardis, with samples from different seasons and years (spring, summer and autumn, 2011-2013). *Podarcis lilfordi* is expected to feed on both invertebrates and fruits/seeds.

In the study, social network analysis is used and the variation in the structure of the lizard individual–food item network is compared between the two islets and among males, females and juveniles on the two islets separately. It defines the food niche of a lizard individual qualitatively as number of different food items in its diet (linkage level). Given that linkage level of the entire population is the sum of all links established by its individuals, it is expected that the population diet niche is determined by two mechanisms: individuals are as generalized as their population, i.e. all individuals have similar feeding niche, or individuals are more specialized than their population, i.e. to what extent the individual niche is narrower than the niche of the species, and the shape of the frequency distribution of individual niche width. I explore the variation in food niche width at both the level of the individual and that of the population on each of the two islets.

MATERIALS AND METODS

Study site

The data sampling was carried out on two islets south of Mallorca, named Na Moltona (39°18'16.24" N, 3°00'39.90" E) and Na Guardis (39°18'36.97" N, 3°00'04.40" E) (Figure 1).

Na Moltona is 5.09 ha in area and consists of rocks, sand and vegetation. The islet has a small sandy beach from where it is possible to leave the boat and easily enter the coast; therefore this islet is sometimes disturbed by people.

Na Guardis is 1.98 ha in area and consists also of rocks, sand and vegetation. However, the vegetation on this islet is less diverse and lower than the vegetation on Na Moltona. Furthermore, Na Guardis is less disturbed, because it is less accessible due to a rockier coastline.

The species of the study

The endemic lizard *Podarcis lilfordi* was used in this study. *Podarcis lilfordi* is categorized as endangered (IUCN) and is mainly found on islets isolated from the main islands Mallorca and Minorca, due to human introduction of domestic animals some thousand years ago, which nearly exterminated the lizard on these large islands (Pérez-Mellado *et al.* 2008, Terrasa *et al.* 2008).

Several subspecies exist and they vary in body size, coloration and scalation characteristic, but in general all subspecies are medium-sized (Pérez-Mellado *et al.* 2008) and actively foraging (Castilla & Bauwens 2000).

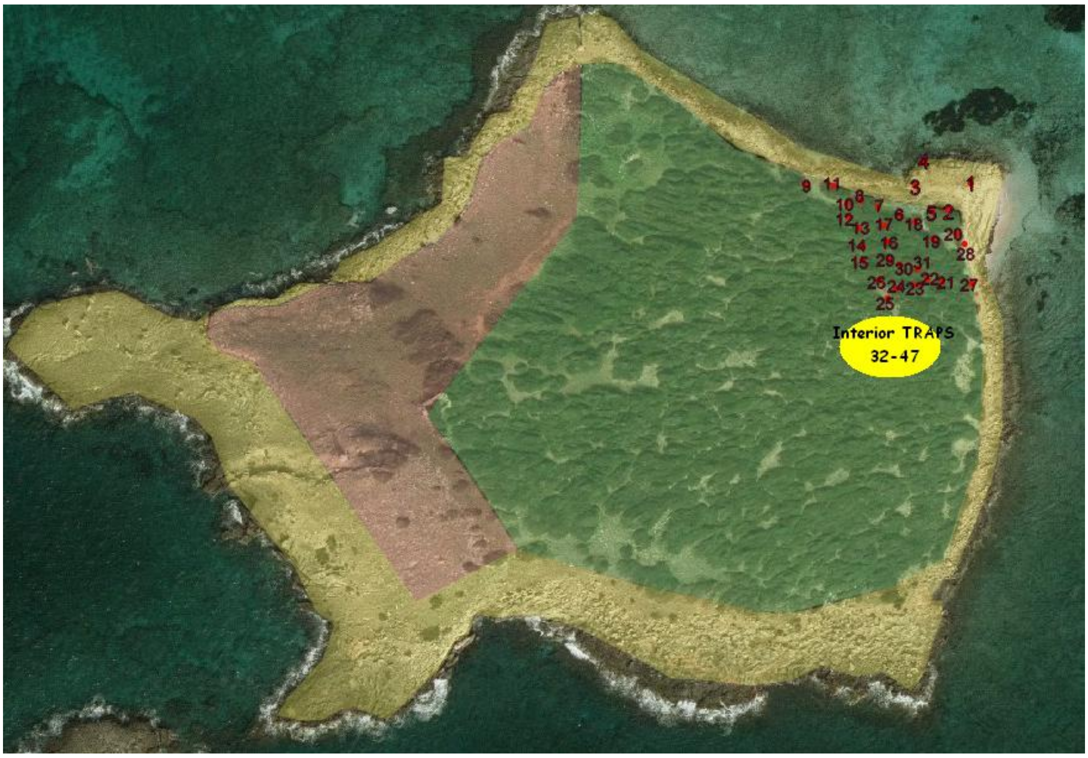
Data sampling

The sampling of feces was carried out during spring (5th of April – 15th of April; 9th of April – 17th of April, 2013) and autumn (7th of October – 10th of October, 2011; 11th of October – 22nd of October, 2012). A few additional summer observations were included as well.

The fieldwork was carried out at daytime in mainly sunny weather, mild or no wind and temperatures between 18-29°C, which gave the best conditions for active lizards.

Fig. 1.

Map of Na Moltona and the position of the 47 traps.



Map of Na Guardis and the position of the 25 traps.

To catch the lizards a capture-recapture process was used by making some pit-fall traps of carved plastic bottles and placed within or next to the vegetation. Some butter and a piece of tomato were placed in the pit-fall traps to attract the lizards.

The pit-fall traps were placed in a way that included the vegetation area on both islets (47 traps on Na Moltona and 25 traps on Na Guardis, see Figure 1), and then left undisturbed for 10-30 minutes, depending on the weather conditions and hence activity of the lizards. The lizards were collected and carried in small individual bags from each trap so they, after the data sampling, could be freed at the same place as they were caught. Meanwhile doing the data sampling the lizards were kept in a cooling box and always in the shadow so they had the least harmful and stressful conditions when being held in their plastic bag.

Each of the collected lizards was measured in length (SVL) and weight, and a photo was taken, used for later photo identification and sex determination. Furthermore, the lizard was stigmatized so it could be recognized later in the ongoing capture-recapture project. If the lizards emptied their bowels doing the measurements, the feces were collected in Eppendorf tubes and the identity of the specific lizard individual was noted.

On each islet, plants were sampled and identified and later used as a reference collection in the identification of seeds in the lizards diet.

Dietary analysis

The content of each feces sample was examined under a microscope and separated in food items (insects, snails, spiders, seeds etc.) and other items (stones, sand etc.). The food items were identified by the same person every time (Dr. Xavier Canyelles). Many of the food items were found in a fragmented state (a leg, a part of the body/a shell, a head etc.), therefore a specific number of consumed prey species was hard to estimate, so the present-absent method was used instead.

The food items were identified to family level and if possible to genus or species level. The seeds were, if possible, identified to the plant species of origin.

Networks

According to the dietary analysis, eight different individual-resources networks were constructed (Na Moltona – All seasons, Na Guardis – All seasons, Na Moltona – Males, Na Moltona – Females, Na Moltona – Juveniles, Na Guardis – Males, Na Guardis – Females and Na Guardis – Juveniles, see Appendices 1–8).

Each two-mode network can be described as a matrix (Pires *et al.*, 2011), which lists the interactions between lizard individuals (rows) and food items (columns). The matrix consists of 1 and 0, where 1 represents an interaction between a lizard individual and a food items and 0 represents no interaction. This matrix is a qualitative matrix and it was used in the analysis. Quantitative matrices state the exact number of interactions between the individuals and resources, but such matrices were not used in this study due to the very low number of multiple interactions (four individuals in all eight networks).

Social network analysis using the software *Pajek*

For the social network analysis and visualization of networks, the program Pajek 2008 was used. Social network analysis looks for a pattern in the links among nodes and attempts to interpret this pattern (de Nooy *et al.* 2005); in this case between nodes representing lizard individuals and their food items.

Before analysis in Pajek, input files containing information about how many lizard individuals and food items there are in the different kinds of networks, and their interactions were made (Appendices 9–16).

After an input file is read in Pajek, some general information can be obtained. This general information includes number of nodes in total in the network (V_T), number of the two different node types (lizard individuals (V_1) and food items (V_2)) and number of links in the network (L). Two descriptive parameters can be calculated from the above information; number of possible links in the network (L_{max}), given by the formula

$$L_{max} = V_1 \cdot V_2$$

and connectance (C), which is the proportion of possible links which is realized in the network, given by the formula

$$C = L/L_{max}$$

(Dormann *et al.* 2009).

A two-mode network can be analyzed with the standard techniques in Pajek by transforming it into two one-mode networks (de Nooy *et al.* 2005). Then eight one-mode networks containing lizard individuals and eight one-mode networks containing food items are formed. These kinds of one-mode networks often contain multiple lines (de Nooy *et al.* 2005), for example in a one-mode network for lizard individuals, there will be multiple lines if two individuals share more than one food item. Instead of having a network with multiple lines, it can be transformed to a valued network, where the multiple lines are replaced by a single line with a value, which corresponds to the number of lines between these two nodes (de Nooy *et al.* 2005). The derived one-mode networks were all made as valued networks. The value is then a measure of the strength between the connected nodes.

A network can be highly cohesive, which meanss that the network has a tighter structure. Cohesion of a network can be measured by its density, which is given by the percentage of all possible lines in that network. However, the density of a network depends on the network size and therefore it may be hard to compare networks according to density alone without correcting for variation in size. Degree of a node is the number of links the node has and this factor does not depend on network size. In ecological networks, degree is often called linkage level. Then by using the average degree of all nodes the structural cohesion of the network can be measured and networks can be compared (de Nooy *et al.* 2005). From the estimated degrees of nodes in the eight networks, the average degree for each network was calculated.
In order to detect cohesive subgroups of a network, a method called m-slices, which is a technique based on line multiplicity, can be used on the one-mode networks.

Nestedness

Nestedness is a specific link pattern and thus a property of an ecological presence/absence matrix. The matrix has e.g. consumer individuals of a specific species listed as rows and their food items as columns. Figure 2 shows three such matrices, with black squares representing interactions (presences) and blank squares representing no interactions (absences). All three matrices are having the same size and the same number of interactions, but their pattern or topology differs (Guimarães & Guimarães 2006).

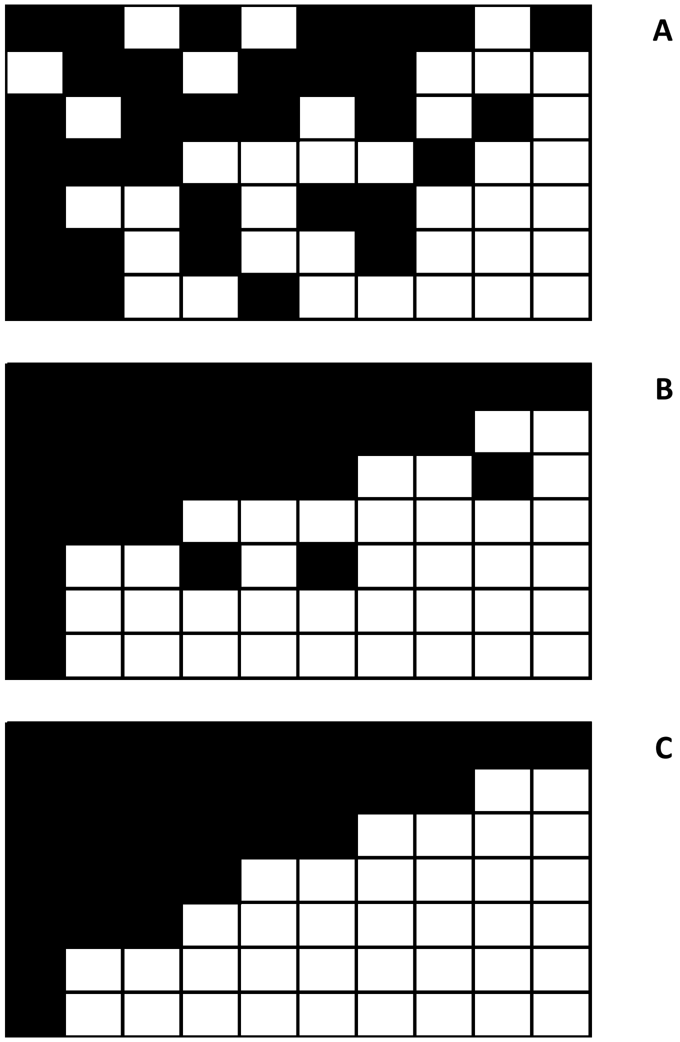


Figure 2. Three presence/absence matrices. Matrix A shows a random pattern; matrix B shows a real nested matrix, and matrix C shows a perfectly nested matrix.

Matrix A shows no order in its pattern and is said to be random or not nested, because each consumer individual interacts randomly with the food items pool (Bascompte *et al.* 2003). In contrast, matrix C shows an order pattern. In a given row (or column), all interactions in that row (or column) are also present in a row (or column), which has a higher number of interactions. Formulated in another way, consumer individual 1 eats all the observed food items, consumer individual 2 eats a part of all the food items that consumer individual 1 eats, consumer individual 3 eats a part of the food items that consumer individual 2 eats and so on. The food items shows the same pattern; food item A are eaten by all, food items B is eaten by a part of A's consumers, food item C is eaten by a part of B's consumers and so on. This is a perfectly nested matrix. However, a perfectly nested matrix is never really seen in nature, therefore, matrix B is a more realistic example of a nested ecological matrix. In conclusion, the purpose of a nestedness analysis is not to detect a perfectly nested matrix, but instead to test if the ecological matrix is more nested than expected by random (Guimarães & Guimarães 2006).

The collected data were arranged in bipartite lizard individual-food item interaction matrices. Using these matrices, the level of nestedness and also modularity (see below) were calculated in the networks. For the nestedness analysis the program *ANINHADO* and its index *NODF* were used. We calculated and assessed level of nestedness using ANINHADO *v3* (Guimarães & Guimarães 2006). *NODF* tells if the matrix is nested or not and if so to what extent it is nested. The more nested the more the *NODF* value approaches 100, and if the individuals show a random pattern in their resource use then it will tend to 0 (Araújo *et al.* 2010). Significance of *NODF* was assessed against 1000 randomizations using the null model Ce (Bascompte *et al.* 2003). Ce is a relatively conservative model, including information about the linkage level of the different lizards and food items, i.e. it includes a certain level of reality, and thus it is more difficult to get significant nestedness.

Modularity

Modularity of a network is an organization of species and their links into modules or tightly linked groups. Modules are dense parts of a network whereas the species in the different modules are less linked to each other (Olesen *et al.* 2007).

An algorithm based on simulated annealing (NETCARTO; Guimerà & Amaral 2005a, 2005b) was used to assign all nodes (individual lizards and food items) to a module: NETCARTO identifies highly linked modules of nodes with few links among modules. If NETCARTO is run repeatedly, the position of nodes to a given module has an accuracy of about 90% (Guimerà & Amaral 2005a, 2005b), e.g., in those rare cases where a node has the same number of links connecting it to those modules it is most tightly connected to, it will randomly be assigned to one of these modules. NETCARTO calculates a modularity index *M* of the matrix, measuring how clearly delimited the modules of the network are. *M* approaches 1 the more distinct the modules are, and 0 the less distinct they are (for further explanation see Guimerà & Amaral 2005b). To test whether the network is significantly modular, NETCARTO runs an analysis of 100 randomized networks constrained by the same linkage ranking as the empirical one, e.g., each lizard is ranked according to its link number compared to all other lizards. To each node, NETCARTO assigns a topological role characterized by two parameters (Guimerà & Amaral 2005b; Olesen *et al.* 2007): (1) standardized within-module degree *l*:

$$l_i = \frac{k_{is} - \bar{k}_s}{SD_{ks}},$$

and (2) among-module connectivity, r , i.e. how a node within a modules is positioned with respect to other modules:

$$r_i = 1 - \sum_{t=1}^{N_M} \left(\frac{k_{it}}{k_i} \right)^2,$$

where k_{is} is the number of links of *i* to other nodes in its own module *s*; $\overline{k_s}$ and SD_{ks} are average and standard deviation of within-module *k* of all nodes in *s*; k_i is the number of links of *i*; and k_{it} is number of links from *i* to species in module *t* (including *i*'s own module). If *i* has all its links within its own module, $r = 0$; but if these are distributed evenly among modules, $r_i \rightarrow 1$. The number of food items of a lizard and the number of lizards consuming a food item thus decide the lizard's and the food item's position in the two-dimensional *l*-*r* space. The horizontal line in Figure 3 represents l = 2.5, the vertical line r = 0.625 (for choice of threshold values, see Guimerà & Amaral 2005b, Olesen *et al.* 2007). Lizards and food items with r values ≤ 0.625 have at least half of their links within their own module.

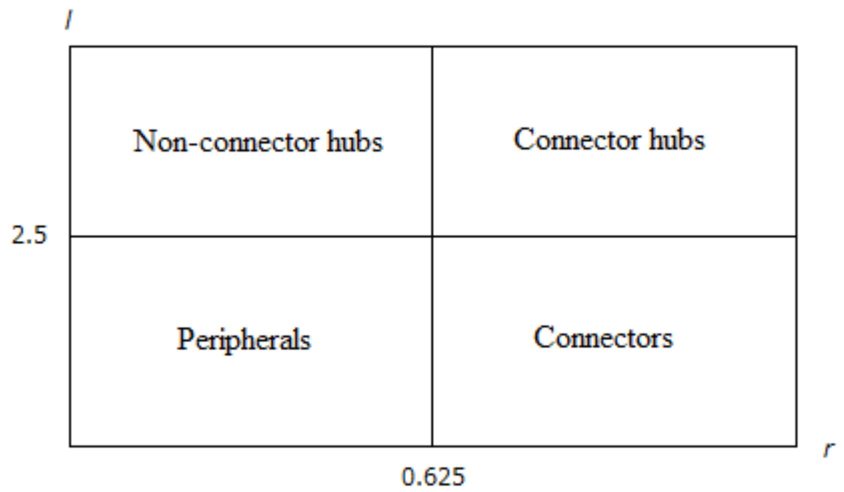


Figure 3. *l*-*r* parameter space and the four roles.

A lizard's value of l thus provides information on the number of food items from the local habitat (within module) that the lizard shares with other lizards in the module, relative to the other lizards in the module. The value of r is a measure of how widely a lizard links to other modules, so that a lizard whose diet comprises items evenly from all modules obtains the maximum value of r. I use the following terms for roles: peripherals, connectors, non-connector hubs, and connector hubs (Olesen *et al.* 2007, Figure 3).

RESULTS

The populations and their structure

The number of samples collected in the different periods and on the two islets varied. In spring 2011, 33 samples were collected, 20 of them from Na Moltona (2 with unknown sex), 11 from Na Guardis and two with unknown islet and sex. In summer 2011, 18 samples were collected, six from Na Moltona and 12 from Na Guardis. In autumn 2011, 38 samples were collected, 32 from Na Moltona (seven with unknown sex), five from Na Guardis (one with unknown sex) and one with unknown islet and sex. Furthermore four samples were collected this year without any information about season, islet and sex. In autumn 2012, 67 samples were collected, 49 from Na Moltona, where 16 of this were collected by hand and therefore with unknown sex and 18 from Na Guardis. In spring 2013, 38 samples were collected, 22 from Na Moltona and 16 from Na Guardis.

For individual-resource network analysis only known individuals could be used. Therefore 104 samples from all seasons on Na Moltona were used and this were distributed on 97 lizard individuals (M1-M97) and 61 samples from all seasons on Na Guardis were used and distributed on 53 lizard individuals (G1-G53). Forty–nine individuals on Na Moltona were males, 41 females and seven juveniles. On Na Guardis, 28 individuals were males, 21 females and four were juveniles. Lizard individual sex, SVL, weight and capture date/dates are listed in Appendix 17.

Table 1 shows the results from the plant sampling at Na Moltona and the fruit and seed type of each plant. In total 27 plants were found, but two of these were doubtful and two were unknown. Likewise, Table 2 presents the same from Na Guardis, where 16 plants were found and one of them doubtful.

Table 1. Plants on Na Moltona.

Plant species	Fruit	Seed
Arisarum vulgare	greenish berry	2–6 brown seeds
Arthrocnemum macrostachyum	dry achene	black with smal tubercles
Arum pictum	red berry	
Asparagus horridus	black berries	one seed per fruit
Astragalus balearicus		
Atriplex halimus	achene	
Chenopodium murale		black seeds
Dorycnium sp.	achene	
Ephedra fragilis	10–cm red with pulp	
Juniperus phoenicea	slightly fleshy reddish cone	
Lavatera arborea	dry capsule	
Lotus ornithopodiodes or *L. cytisoides*	dry black/brown pod	several seeds per fruit
Olea europea	thin pulp layer	one seed per fruit
Pancratium maritimum	dry capsule	several, black and relatively large
Phillyrea angustifolia	drupe	one seed per fruit
Pinus halepensis	cone	dry seeds
Pistacia lentiscus	red dry with fleshy pericarp	one seed per fruit
Portulaca oleracea	dry capsule	very small seeds
Rhamnus oleoides	black berry	one seed per fruit
Rosmarinus officinalis	dry	four seeds per fruit
Rubia peregrine	fleshy black berries	one seed per fruit
Ruscus aculeatus	red and round	one seed per fruit
Sisymbrium erysimoides or *S. irio*	long and rigid	
Suaeda vera		
Urginea maritima	dry capsule	one seed per fruit
Unknown 1		
Unknown 2		

References: www.herbarivirtual.uib.es

Table 2. Plants on Na Guardis.

Plant species	Fruit	Seed
Arthrocnemum macrostachyum	dry achene	black with smal tubercles
Asparagus horridus	black berry	one seed per fruit
Crithmum maritimum	capsule of two spongy mericarps	2 seeds per fruit
Diplotaxis ibicensis	long and greenish dry siliqua	many seeds per fruit
Echium sp.	dry fruit	four nutlets in a persistent calyx
Helichrysum stoechas	dry achene	one seed per fruit
Limonium sp.	dry capsule	one seed per fruit
Lotus ornithopodiodes or *L. cytisoides*	dry black/brown pod	several seeds per fruit
Olea europea	thin pulp layer	one seed per fruit
Pancratium maritimum	dry capsule	several, black and relatively large
Pinus halepensis	cone	dry seeds
Pistacia lentiscus	red dry with fleshy pericarp	one seed per fruit
Portulaca oleracea	dry capsule	very small seeds
Rubia peregrine	fleshy, black berry	one seed per fruit
Sporobolus pungens	dry achene	one seed per fruit
Urginea maritime	dry capsule	one seed per fruit

References: www.herbarivirtual.uib.es

Both populations were strongly male–biased. The populations had the same proportion of juveniles. Only seven lizards were captured more than once. Based on capture–recapture calculations, the Na Moltona population was expected to be several times larger than that on Na Guardis (see Table 3, Na Guardis: 9 (no. captured at first census)/x =1(no. recaptured at next census)/9(no. captured at first census), x = 81 and 17/x = 3/17, x = 96; Na Moltona: 17/x = 3/17, x = 512, where x is population size).

Table 3. Population structure of the two islet lizard populations based on five censuses from Spring 2011 to Spring 2013. Total capture was 157 individuals (range per census 19–49 captures).

	Guardis	Moltona	Total
No. traps	25	47	72
No. lizards	53	97	150
No. lizards/trap	2.1	2.1	2.1
No. females	21	41	62
No. juveniles	4	7	11
No. males	28	49	77
Male/female	1.33	1.20	1.24
Pct. juveniles	7.55	7.22	7.33

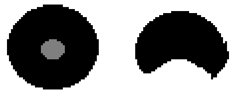
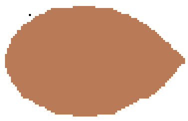
Dietary analysis

Analyses of the feces samples gave an identification of 47 invertebrate species and three seed types. Nearly all invertebrates were arthropods, but molluscs were also present. Insects constitute the largest group in the lizard diet and among these beetles (Coleoptera) are the most numerous. Appendix 18 lists the different invertebrates found in the diet of *Podarcis lilfordi*.

The seed types found in the diet are listed in Table 4. One seed could be identified as a seed from *Rubia peregrine,* which was present on both islets. The two other seeds could not be identified, but are illustrated in Table 4. Unidentified seed 1 was large

(0.5-0.8 mm) and present on both islets, whereas unidentified seed 2 was small (≈ 0.2 mm) and only present on Na Guardis.

Table 4 Seeds in the diet of *Podarcis lilfordi*

Seed	Identification	Illustration
1	*Rubia peregrine*	Side view  Bottom view
2	Unidentified seed 1	 Side view
3	Unidentified seed 2	 Side view

The animal orders represented in the diet of *Podarcis lilfordi* on the two different islets are quite similar. However, three orders are noteworthy; Julida, Dermaptera and Orthoptera. Food items from the two first orders were consumed by individuals from Na Guardis only, and food items from the last order were consumed by individuals from Na Moltona only. All three orders however, were the smallest component of the two populations' diet (0.8 %, 0.8 % and 0.4 %, respectively).

Comparing the frequency of occurrence of the different food items on Na Moltona and Na Guardis shows a nearly identical picture (Tables 5 and 6). The frequency of food items was calculated at the level of order, but for the two most frequent orders, family level wa included for the most numerous families in a given group. Furthermore, the number of consumed items from each level were sorted into seasons and summed in total.

The most frequent consumed order was Coleoptera on both islets (28.7 % on Na Moltona and 31.3 % on Na Guardis). Further, the most consumed family in Coleoptera was Curculionidae (62.5 % and 56.1 %, respectively), but the number of consumed items in the different seasons varied between the two islets. Individuals from Na Moltona consumed most prey from Curculionidae in autumn, whereas individuals from Na Guardis consumed most in spring. Two other families (Chrysomelidae and Staphylinidae) were consumed with a frequency of 8.3 % and 18.1 %, respectively, on Na Moltona, and 12.2 % and 14.6 %, respectively, on Na Guardis. The two islets showed the same pattern in their consumption of the three families, however taking other families of Coleoptera into account, individuals from Na Guardis consumed species from these families more frequent that species from Chrysomelidae and Staphylinidae (17.1 %), whereas individuals from Na Moltona only consumed species from the other families more frequently than species from Chrysomelidae (11.1 %).

The second most frequent consumed order was Hymenoptera on both islets (22.3 % on Na Moltona and 22.1 % on Na Guardis). The family most frequently consumed in this order was Formicidae (89.3 % and 86.7 %, respectively) and the rest 10.7 % and 10.3 %, respectively, represent other families in the order Hymenoptera.

The ranking of the remaining orders varied slightly between Na Moltona and Na Guardis. However, Polydesmida, Diptera and Pulmonata were the most frequent consumed items for both islets and Araneae the less consumed (except for the orders Julida, Dermaptera and Orthoptera mentioned earlier). On Na Moltona, Polydesmida represented 13.5 % of the diet, Diptera 9.6 %, Pulmonata 8.0 %, and Araneae 1.6 % and on Na Guardis they represented 6.9 %, 12.2 %, 8.4 %, and 1.5 %, respectively. The remaining orders in the diet were Hemiptera, Lepioptera and Pseudoscorpionida with a frequency of 4.4 %, 4.0 % and 3.2 % on Na Moltona and 3.1 %, 3.1 % and 4.6 % on Na Guardis, respectively.

Plant material was almost consumed equally on both islets (4.4 % of the diet on Na Moltona and 5.3 % on Na Guardis). However, seeds were only found in the diet in autumn on Na Moltona, whereas they were found in all three seasons on Na Guardis.

In general, food items were more often found in autumn samples from Na Moltona and spring samples from Na Guardis.

Table 5 Frequency of food items in the diet of *Podarcis lilfordi* in different seasons on Na Moltona

Food item	Spring	Summer	Autumn	Total	Frequency of occurrence (%)
Araneae	**1**	**1**	**2**	**4**	1.6
Pseudoscorpionida	**1**	**3**	**4**	**8**	3.2
Julida	**-**	**-**	**-**	**-**	-
Polydesmida	**1**	**-**	**33**	**34**	13.5
Coleoptera	**22**	**7**	**43**	**72**	28.7
- Chrysomelidae	1	2	3	6 (8.3 %)	(2.4)
- Curculionidae	12	5	28	45 (62.5 %)	(17.9)
- Staphylinidae	5	-	8	13 (18.1 %)	(5.2)
- Other	4	-	4	8 (11.1 %)	(3.2)
Dermaptera	**-**	**-**	**-**	**-**	-
Diptera	**22**	**-**	**2**	**24**	9.6
Hemiptera	**7**	**-**	**4**	**11**	4.4
Hymenoptera	**19**	**3**	**34**	**56**	22.3
- Formicidae	15	3	32	50 (89.3 %)	(19.2)
- Other	4	-	2	6 (10.7 %)	(2.4)
Lepidoptera	**4**	**-**	**6**	**10**	4.0
Orthoptera	**-**	**-**	**1**	**1**	0.4
Pulmonata	**10**	**-**	**10**	**20**	8.0
Plant material	**-**	**-**	**11**	**11**	4.4
Total	**87**	**14**	**150**	**251**	**100**

Table 6 Frequency of food items in the diet of *Podarcis lilfordi* in different seasons on Na Guardis

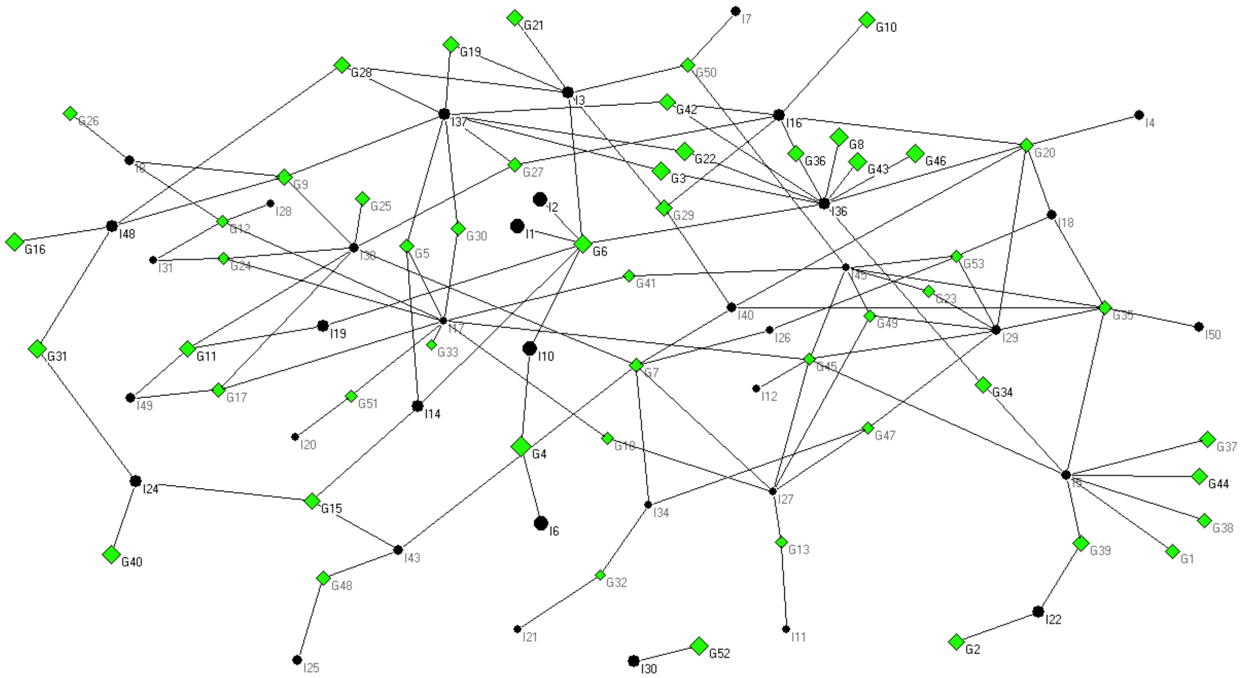
Food item	Spring	Summer	Autumn	Total	Frequency of occurrence (%)
Araneae	**2**	**-**	**-**	**2**	1.5
Pseudoscorpionida	**2**	**4**	**-**	**6**	4.6
Julida	**1**	**-**	**-**	**1**	0.8
Polydesmida	**1**	**-**	**8**	**9**	6.9
Coleoptera	**23**	**8**	**10**	**41**	31.3
- Chrysomelidae	4	1	-	5 (12.2 %)	(3.8)
- Curculionidae	13	5	5	23 (56.1 %)	(17.6)
- Staphylinidae	1	-	5	6 (14.6 %)	(4.6)
- Other	5	2	-	7 (17.1%)	(5.3)
Dermaptera	**1**	**-**	**-**	**1**	0.8
Diptera	**16**	**-**	**-**	**16**	12.2
Hemiptera	**2**	**1**	**1**	**4**	3.1
Hymenoptera	**6**	**12**	**11**	**29**	22.1
- Formicidae	4	12	10	26 (86.7 %)	(19.8)
- Other	2	-	1	3 (10.3 %)	(2.3)
Lepidoptera	**3**	**1**	**-**	**4**	3.1
Orthoptera	**-**	**-**	**-**	**-**	-
Pulmonata	**10**	**-**	**1**	**11**	8.4
Plant material	**1**	**3**	**3**	**7**	5.3
Total	**68**	**29**	**34**	**131**	**100**

Network analysis with Pajek

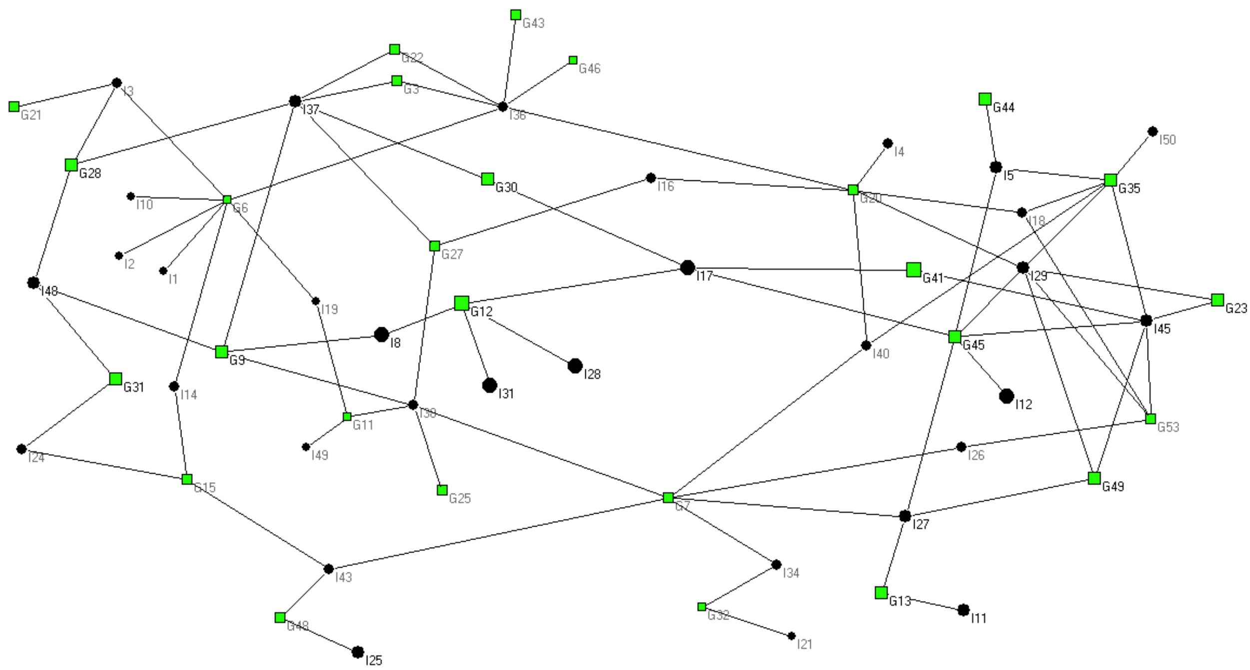
From the input files, network visualizations in Pajek of the eight two-mode networks were constructed (Figures 4–5). All networks represent interactions between lizard individuals and their food items.

Two-mode networks

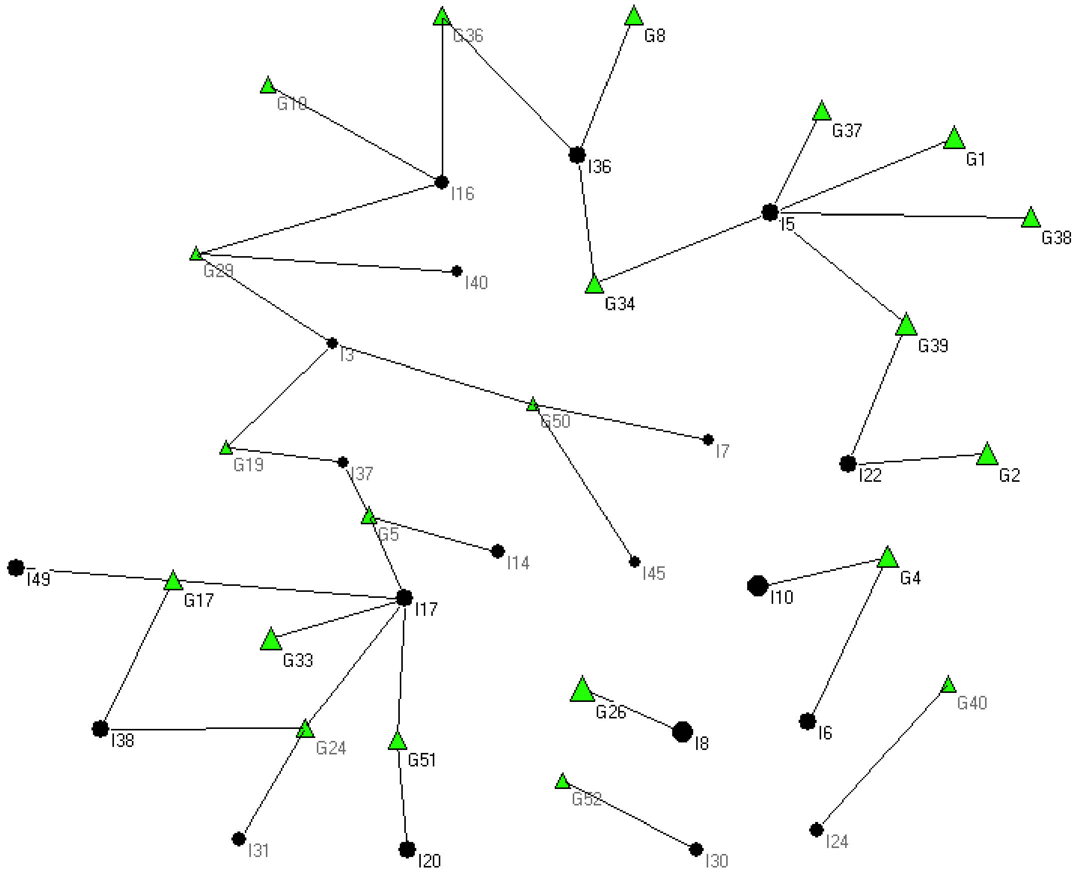
Na Guardis - All seasons



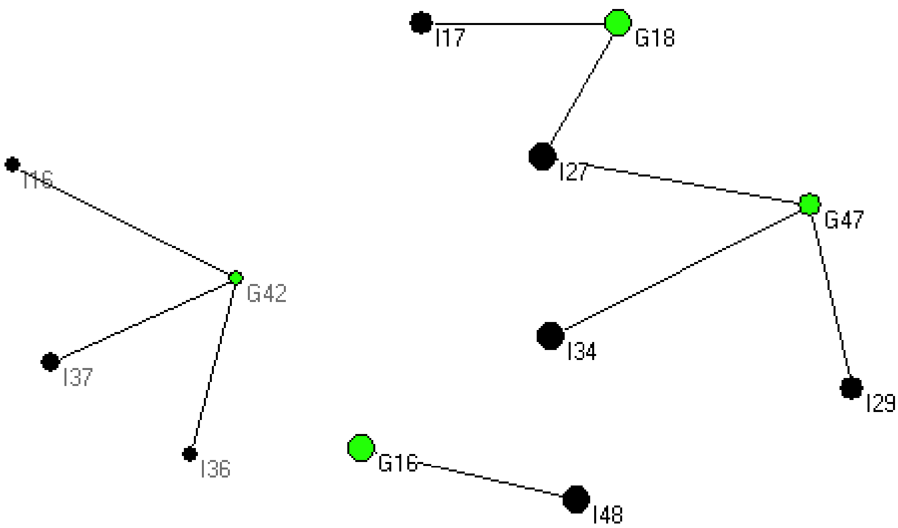
Na Guardis - Males



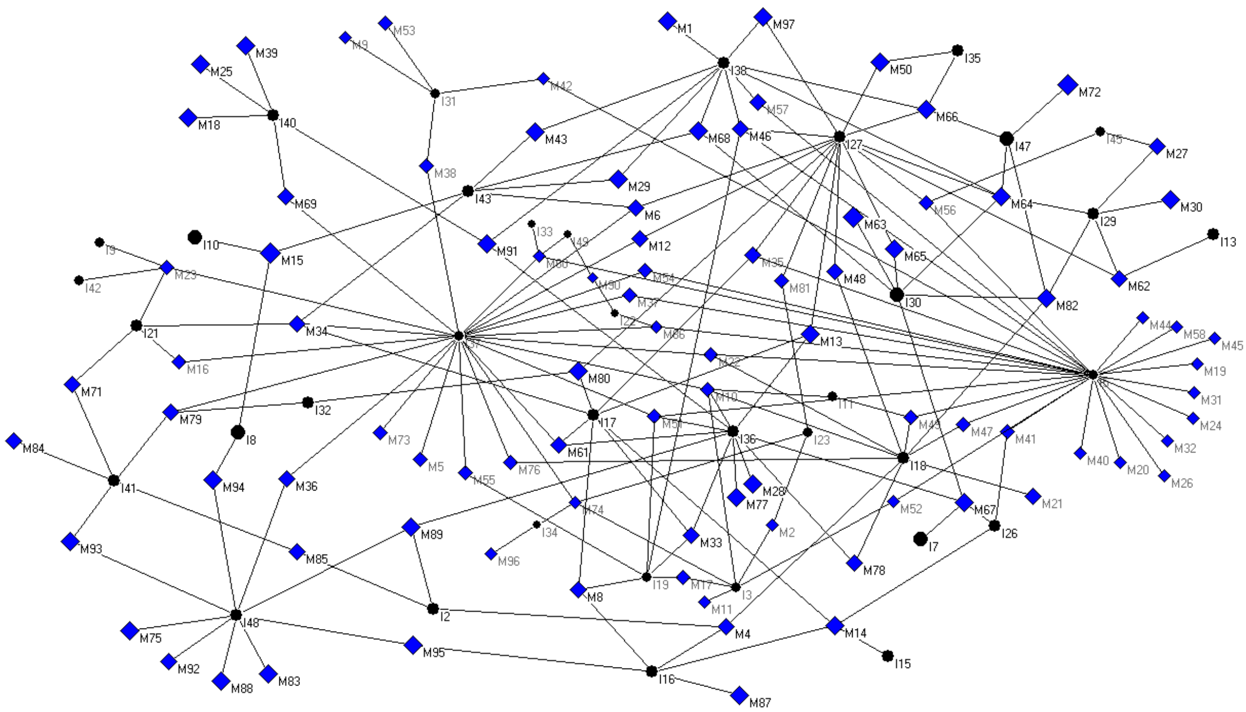
Na Guardis – Females



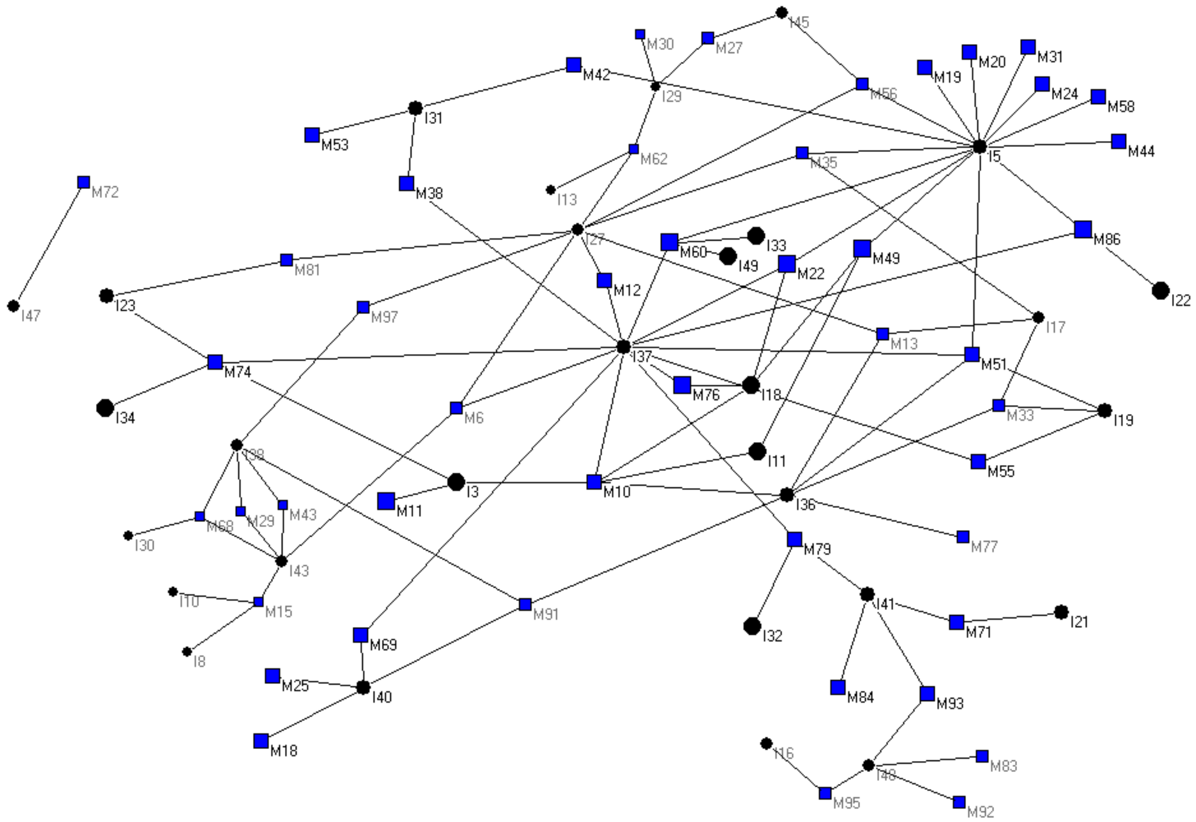
Na Guardis – Juveniles



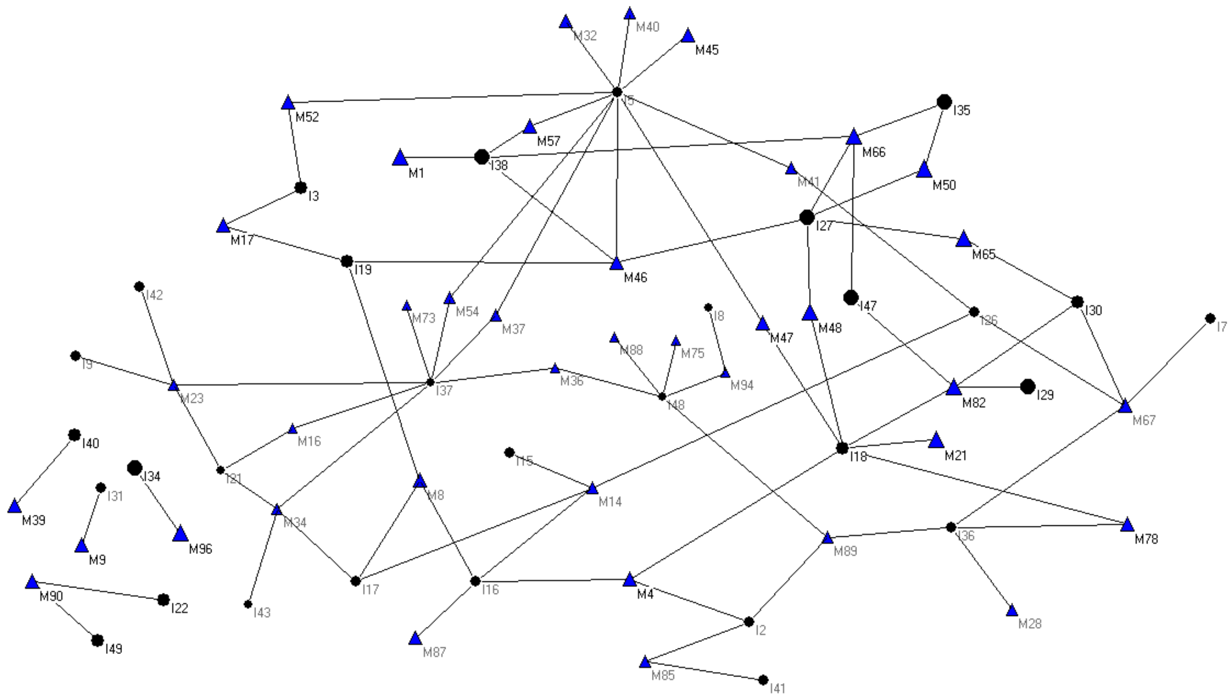
Na Moltona – All seasons



Na Moltona – Males



Na Moltona – Females



Na Moltona – Juveniles

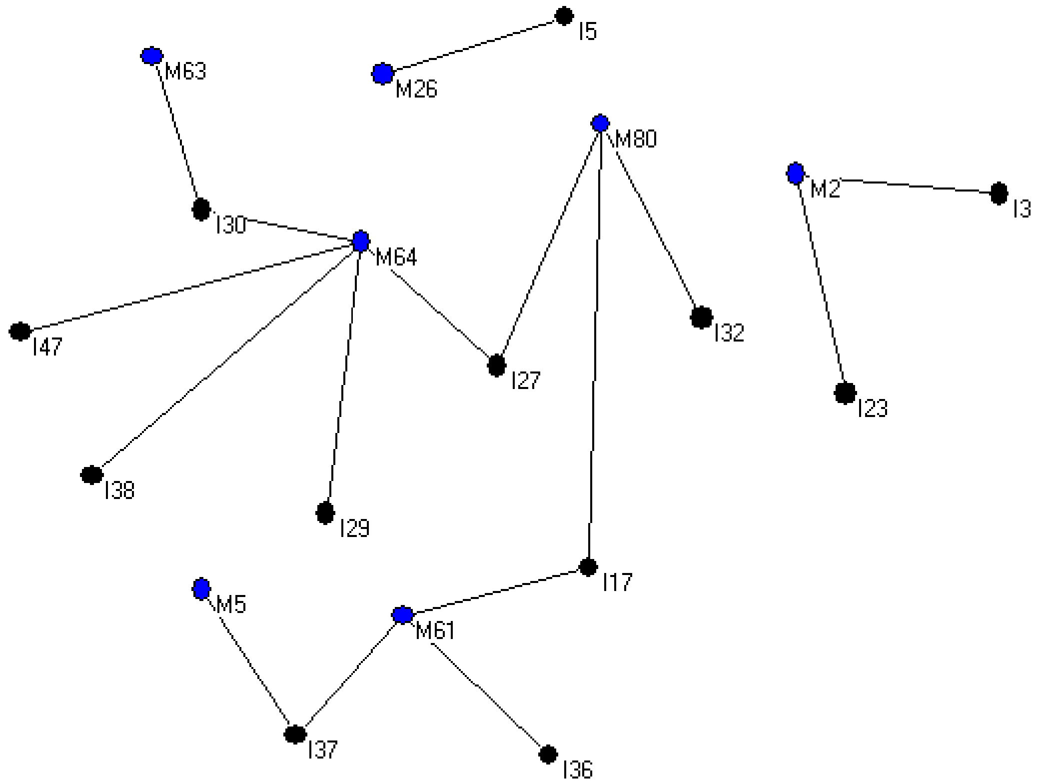
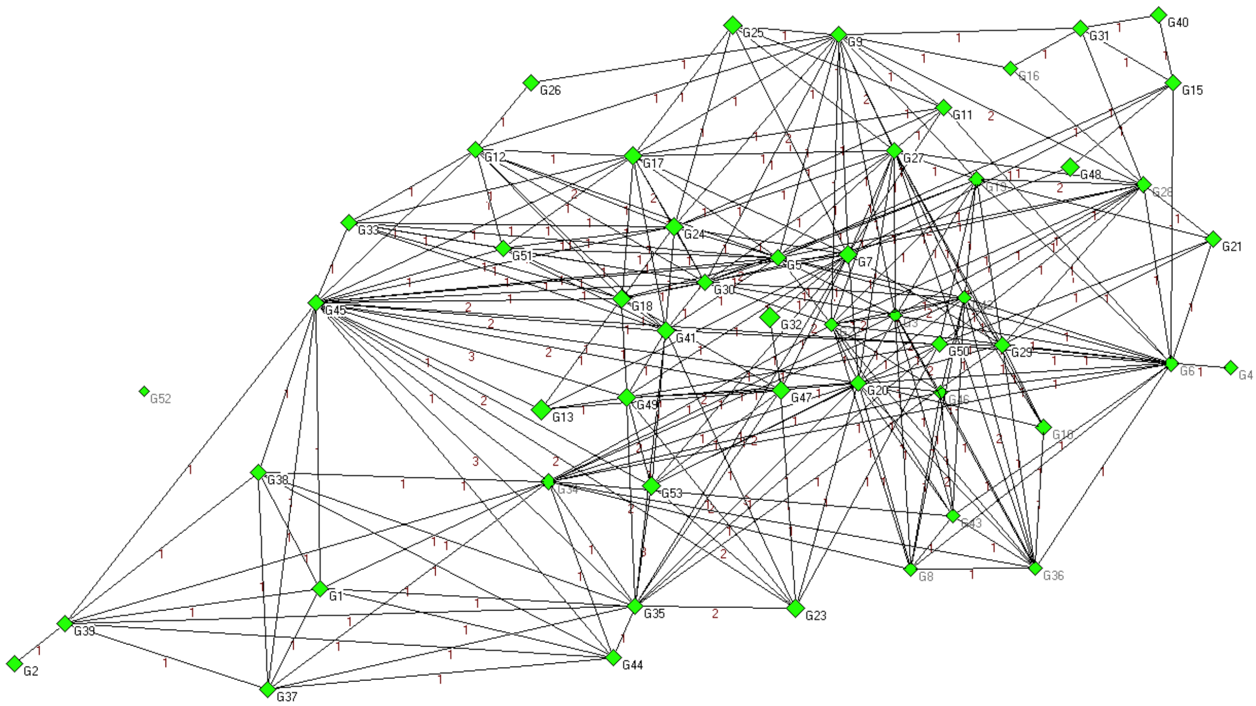


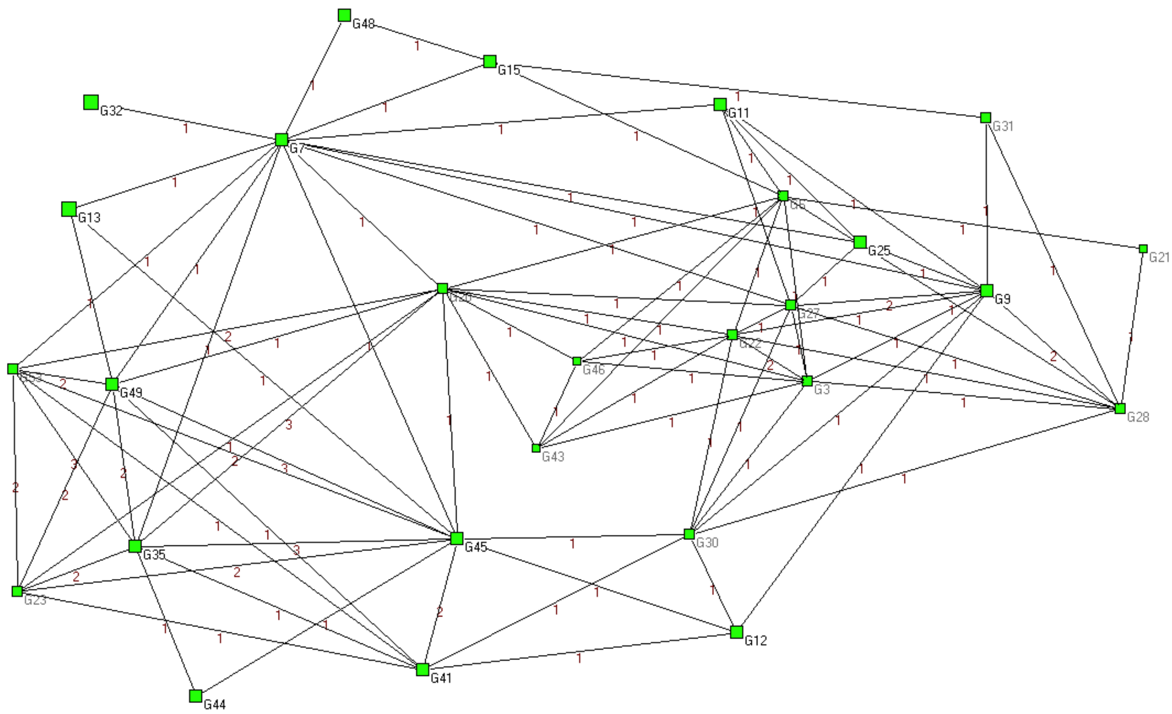
Figure 4. Two-mode networks. In order easily to recognize the different nodes in the networks, colors and symbols are used. Food items are represented as a black circle in all networks, whereas lizard individuals are represented by different colors and symbols according to the network type. Lizard individuals from Na Moltona are labeled blue and lizard individuals from Na Guardis green. In the networks Na Moltona – All seasons and Na Guardis – All seasons, the lizard individuals (males, females and juveniles) are represented as diamonds. In the last six networks (Na Moltona – Males, Na Moltona – Females, Na Moltona – Juveniles, Na Guardis – Males, Na Guardis – Females and Na Guardis – Juveniles) males are represented by boxes, females by triangles and juveniles by circles.

One-mode networks

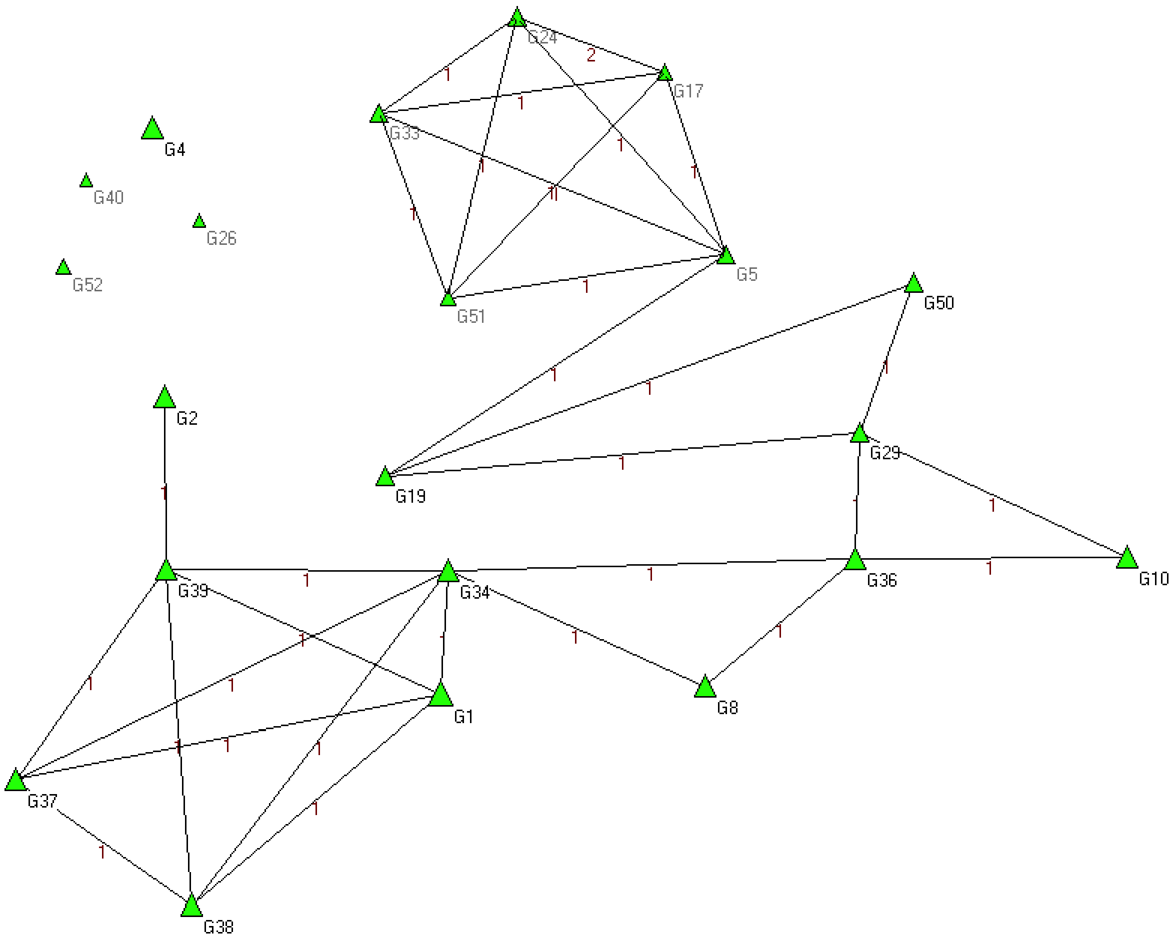
Na Guardis – All seasons



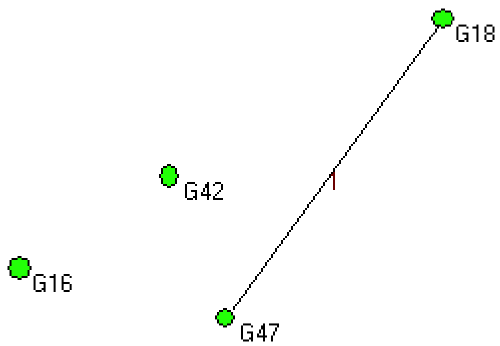
Na Guardis – Males



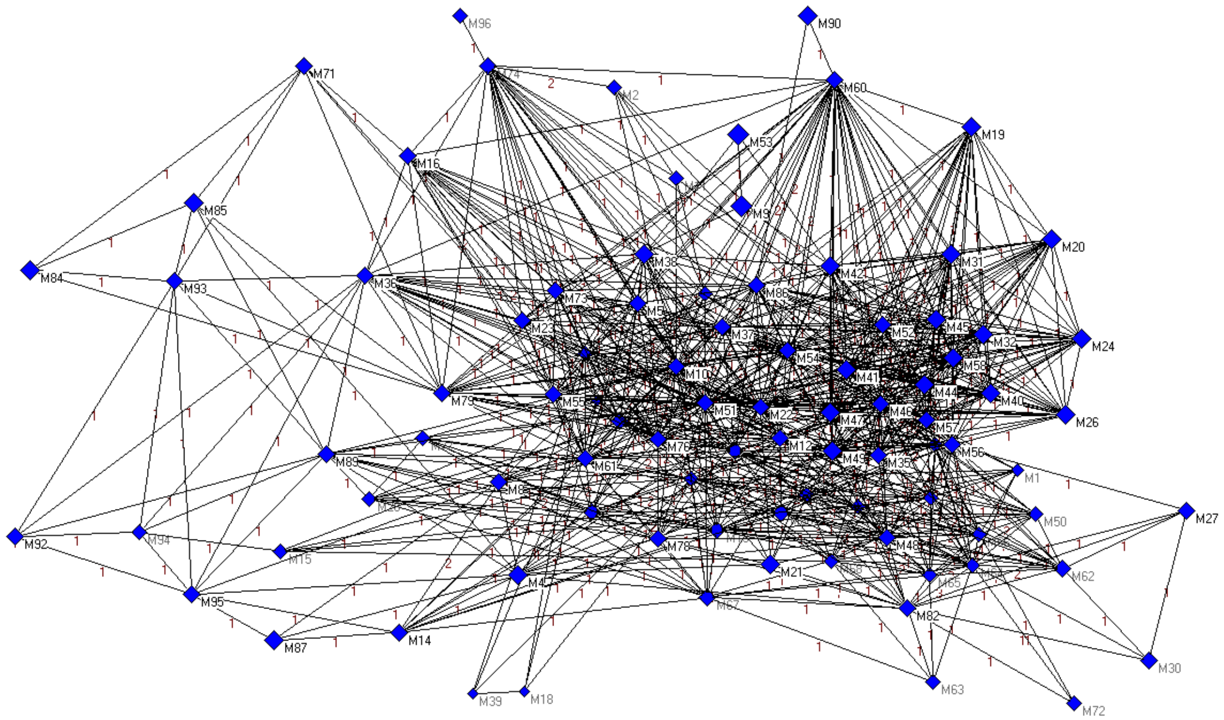
Na Guardis – Females



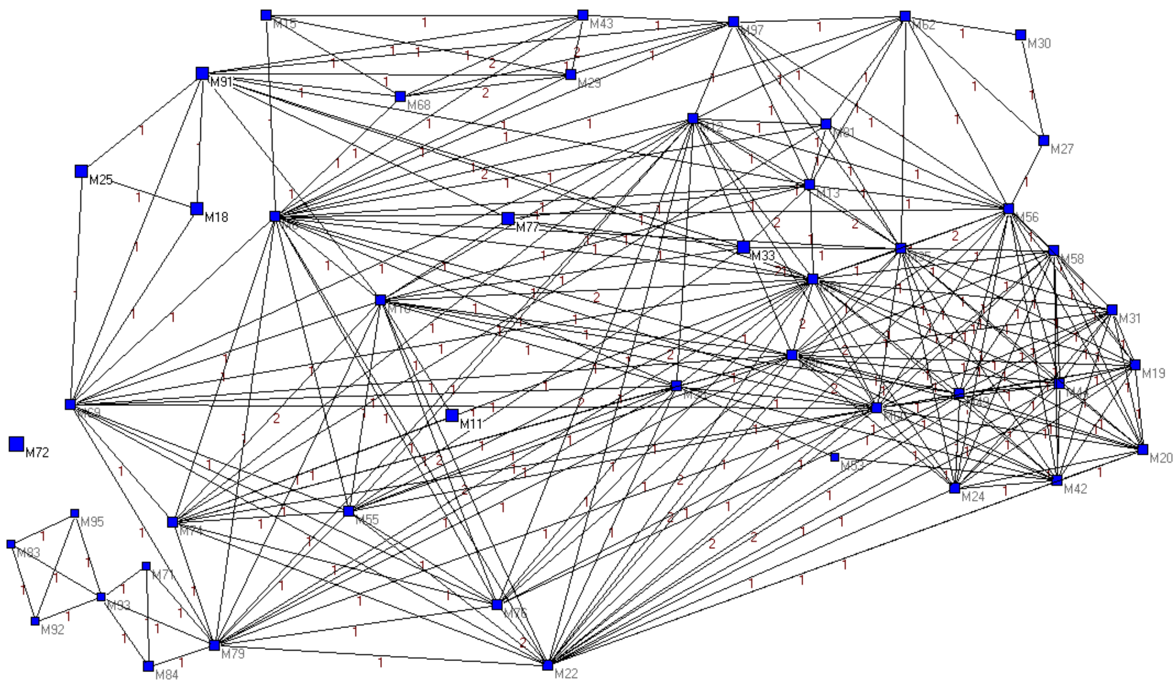
Na Guardis – Juveniles



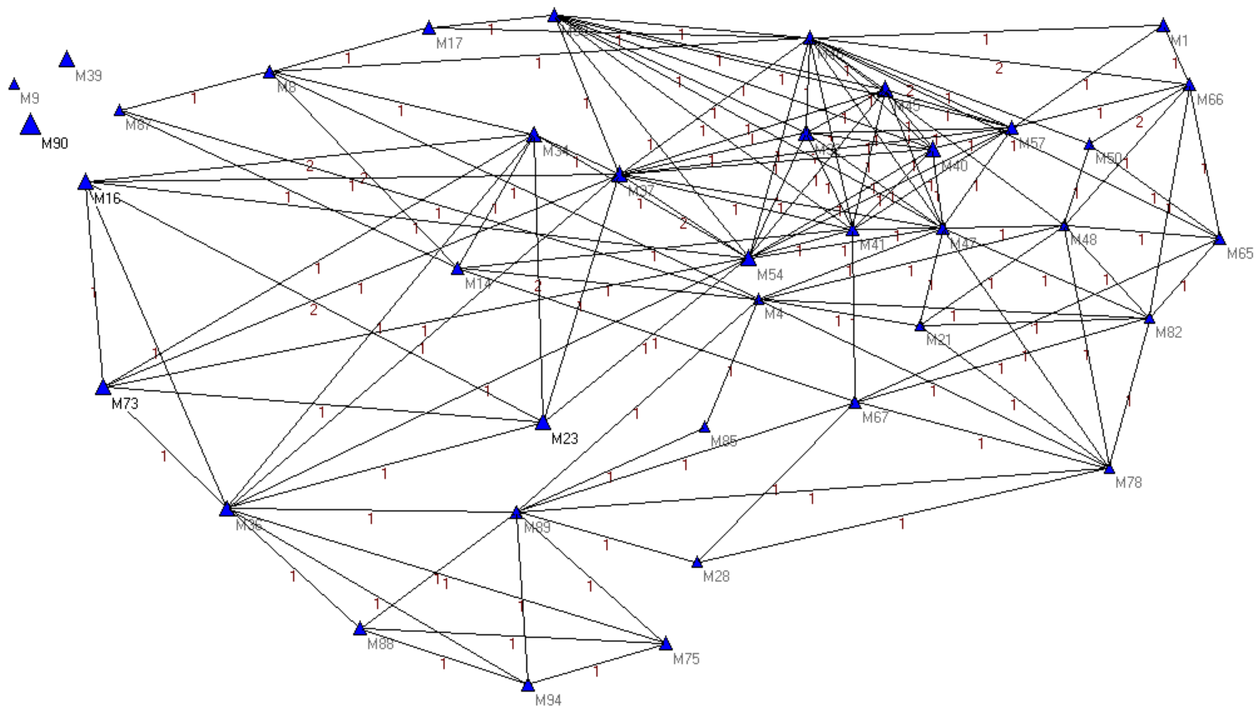
Na Moltona – All seasons



Na Moltona – Males



Na Moltona – Females



Na Moltona – Juveniles

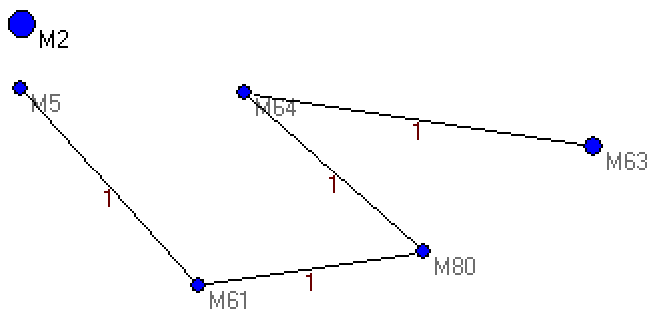


Figure 5. One-mode networks. In order easily to recognize the different nodes in the networks, colors and symbols are used. Food items are represented as a black circle in all networks, whereas lizard individuals are represented by different colors and symbols according to the network type. Lizard individuals from Na Moltona are labeled blue and lizard individuals from Na Guardis green. In the networks Na Moltona – All seasons and Na Guardis – All seasons, the lizard individuals (males, females and juveniles) are represented as diamonds. In the last six networks (Na Moltona – Males, Na Moltona – Females, Na Moltona – Juveniles, Na Guardis –

Males, Na Guardis – Females and Na Guardis – Juveniles) males are represented by boxes, females by triangles and juveniles by circles.

The general information about the eight networks obtained from Pajek and applied formulas (see Materials and methods) are listed in Table 7.

Table 7 Size of networks

Name of network	V(T)	V(1)	V(2)	L	L(max)	C
Na Moltona						
All seasons	130	93	37	198	3441	0.0575
Males	77	47	30	100	1410	0.0709
Females	69	39	30	82	1170	0.0701
Juveniles	19	7	12	16	84	0.1905
Na Guardis						
All seasons	89	52	37	127	1924	0.0644
Males	59	27	32	81	864	0.0938
Females	41	21	20	37	420	0.0881
Juveniles	12	4	8	9	32	0.2813

The network parameters total number of nodes (V_T), number of lizard individuals (V_I) and number of links in the network (L) from Na Moltona were in all networks larger than the parameters of the networks from Na Guardis. All seasons networks contained all known individuals (males, females and juveniles) which made them the largest networks on both islets. For networks representing different sexes, networks containing male individuals were the largest and juvenile individuals networks the smallest.

Connectance values varied from 5.8 % to 28.1 %. The smaller the network the larger the connectance (Connectance = 21.70 – 0.17 Size, N = 8 networks, F = 10.63, R^2 = 0.58, P < 0.02). Thus network size alone explained 58 % of the variation in connectance.

The valued one-mode networks, which show the strength between the different nodes, were constructed, but only the one-mode lizard individual networks are included in the results (Table 8). Values from the networks representing juvenile individuals were not possible to calculate because of the small sizes of these networks.

Table 8 Line values for one-mode networks

Name of network	No. of all lines (%)	No. of lines with value 1 (%)	No. of lines with value 2 (%)	No. of lines with value 3 (%)
Na Moltona				
All seasons	915 (100)	852 (93.11)	61 (6.67)	2 (0.22)
Males	252 (100)	230 (91.27)	22 (8.73)	0
Females	132 (100)	124 (93.94)	8 (6.06)	0
Juveniles	**Not possible**	**Not possible**	**Not possible**	**Not possible**
Na Guardis				
All seasons	262 (100)	230 (87.79)	28 (10.69)	4 (1.53)
Males	87 (100)	71 (81.61)	12 (13.79)	4 (4.60)
Females	31 (100)	30 (96.77)	1 (3.23)	0
Juveniles	**Not possible**	**Not possible**	**Not possible**	**Not possible**

Most individuals only shared one food item (lines with value 1) in all networks. On Na Moltona more than 90 % of all lines had the value 1, whereas this was only true for the female individual network on Na Guardis. In the all–season network and the male individual network on Na Guardis 87.8 % and 81.6 %, respectively, individuals were sharing one food item only. Individuals sharing two food items (lines with value 2) were relatively similar on Na Moltona. For all seasons it was 6.7 %, and 8.7 % for males and 6.1 % for females. Only the network with all seasons had individuals which shared three food items (0.22 %). On Na Guardis, individuals which shared two food items varied noteworthy between the networks. Two networks had over 10 %, which shared two food items (all seasons and male individuals network), and the last network (female individuals network) only had 3.23 %, which shared two food items. Both all seasons and male individuals network had individuals, which shared three food items.

In general all networks had most individuals sharing one food item, a minor part sharing two and very few sharing three, except the Na Guardis female individual network which nearly was made up of individuals only sharing one food item.

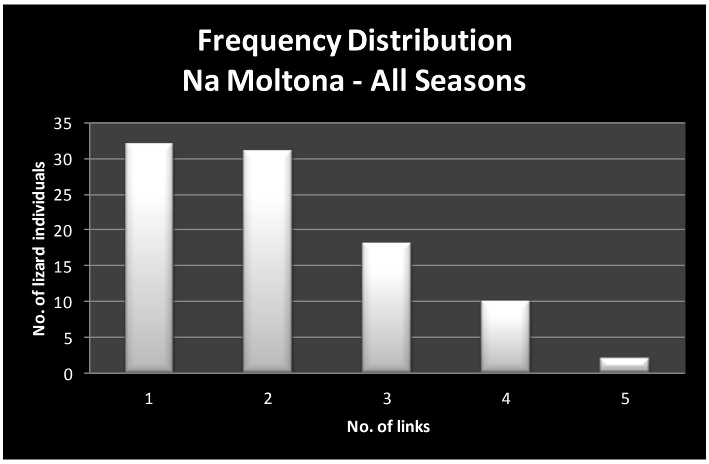
The degree of nodes was obtained in Pajek for all eight two-mode networks. Afterwards the average degree for the different networks was calculated in order to compare the cohesion of the different networks (Table 9).

Table 9 Average degree of nodes

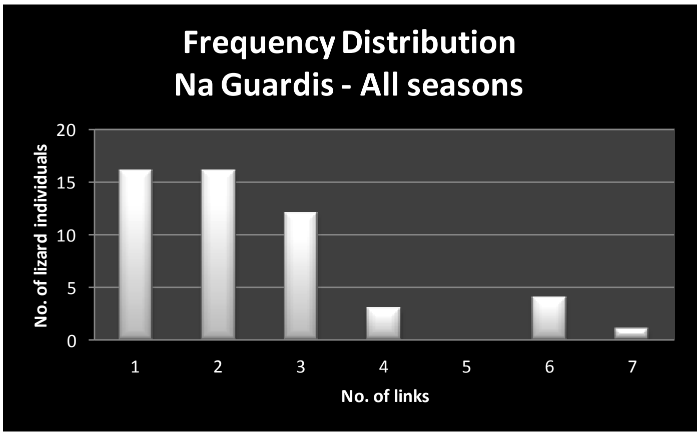
Name of network	Average degree
Na Moltona	
All seasons	3.0
Males	2.6
Females	2.4
Juveniles	1.7
Na Guardis	
All seasons	2.9
Males	2.7
Females	1.8
Juveniles	1.5

To compare the cohesion between networks, the same network type from each islet should be compared. The all–season network from Na Moltona and Na Guardis had about the same average degree (3.0 and 2.9 links, respectively), which meant that they were nearly equally cohesive. Likewise for the male individuals networks (average degree 2.6 links on Na Moltona and 2.7 links on Na Guardis) and juvenile individuals networks (average degree 1.7 links on Na Moltona and 1.5 links on Na Guardis). The female individuals networks varied in average degree between the two islets. On Na Moltona the network showed more cohesion (average degree 2.4 links) than on Na Guardis (average degree 1.8 links). This meant that more links between nodes according to the number of nodes were larger in the female individuals network from Na Moltona and it therefore had a tighter structure.

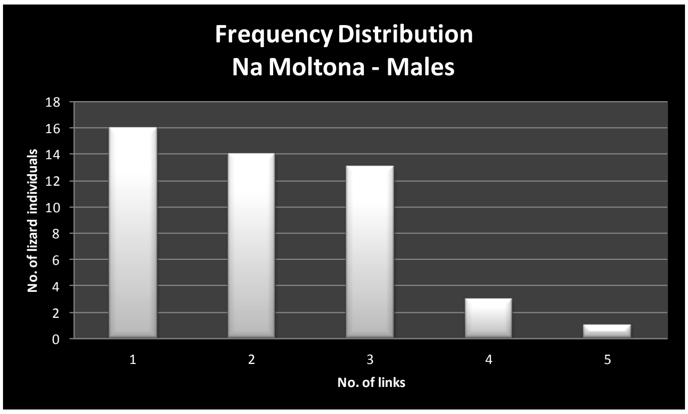
Knowledge about the degree of all nodes, linkage frequency distribution can be made. Figure 6 shows the linkage frequency distribution for lizard individuals in all eight two-mode networks.


Frequency Distribution
Na Moltona - All Seasons
No. of lizard individuals
35
30
25
20
15
10
5
0
1
2
3
4
5
No. of links

A


Frequency Distribution
Na Guardis - All seasons
No. of lizard individuals
20
15
10
5
0
1
2
3
4
5
6
7
No. of links

B


Frequency Distribution
Na Moltona - Males
No. of lizard individuals
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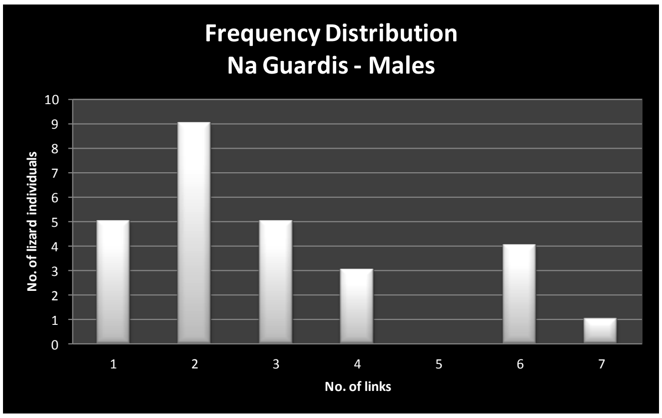
16
14
12
10
8
6
4
2
0
1
2
3
4
5
No. of links

C


Frequency Distribution
Na Guardis - Males
No. of lizard individuals
No. of links
0
1
2
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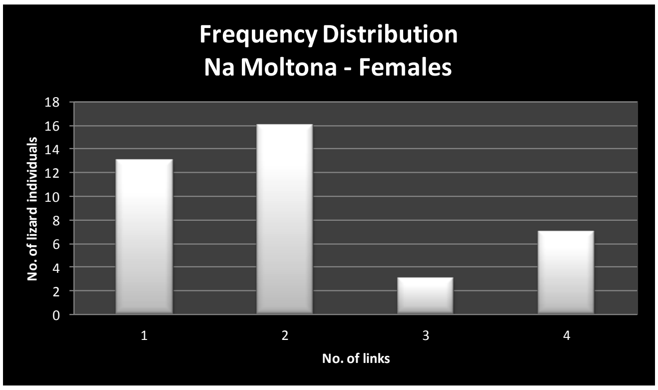
D


Frequency Distribution
Na Moltona - Females
No. of lizard individuals
No. of links
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4
6
8
10
12
14
16
18
1
2
3
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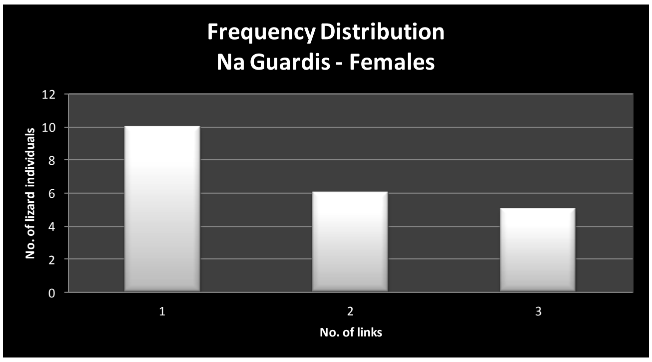
E


Frequency Distribution
Na Guardis - Females
No. of lizard individuals
No. of links
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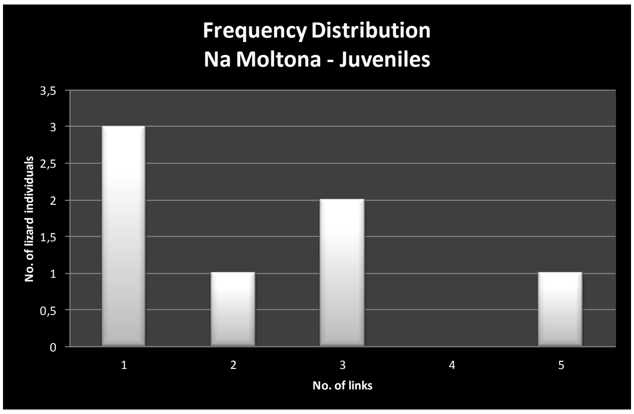
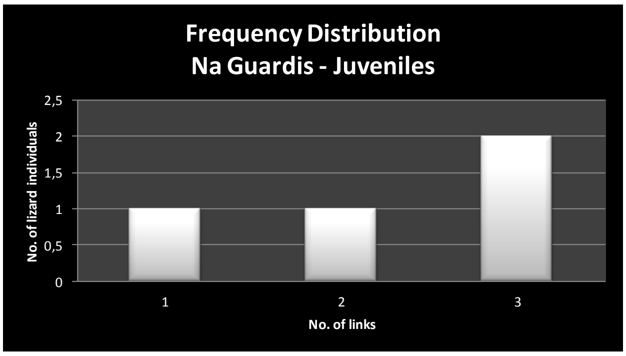
4
6
8
10
12
1
2
3

F



G



H

Figure 6. Linkage frequency distribution for lizards in two-mode networks. All–seasons network Na Moltona (A), all–seasons network Na Guardis (B), male individuals network Na Moltona (C), male individuals network Na Guardis (D), female individuals network Na Moltona (E), female individuals network Na Guardis (F), juvenile individuals network Na Moltona (G), and juvenile individuals network Na Guardis (H).

Graph A in Figure 6 shows linkage level frequency distribution for lizard individuals on Na Moltona for all seasons combined. Most lizards interacted with 1–2 food items and only a few individuals interacted with five food items, which was the highest number of food items an individual from Na Moltona interacted with. Graph B shows linkage level frequency distribution for lizard individuals on Na Guardis for all seasons. The same pattern as for Na Moltona was seen here; i.e. most individuals interacted with 1–2 food items. Seven different food items was the highest number any lizard interacted with. Thus, the level of interaction is higher on Na Guardis than on Na Moltona.

Graphs C, E, and G show linkage level frequency distributions for lizard individuals on Na Moltona for males, females, and juveniles, respectively. Males showed more or less the same pattern as seen in the graph for all seasons, while females having more individuals with two interactions and relatively many individuals with four interactions. Only seven juveniles were represented but they showed nearly the same pattern as the graph for all seasons.

Graphs D, F, and H show linkage level frequency distributions for lizard individuals on Na Guardis for males, females, and juveniles, respectively. As for Na Moltona, males showed the same pattern as the graph for all seasons, except for a slightly lower representation of individuals with one interaction only. Females and juveniles only had 1–3 interactions, even though up to seven interactions were found on Na Guardis. Juveniles had most often three interactions, but only four individuals represented this group.

In general most individuals had few interactions and few individuals had many interactions, i.e. the distributions were right–skewed.

Nestedness

The level of nestedness in the networks for all seasons from Na Moltona was N-total = 10.77 and from Na Guardis 10.22. The nested matrix of Na Moltona is shown in Appendix 19. When the null model was Er, both networks were significant nested, however using a more appropriate null model Ce, only the network from Na Moltona was significant nested (Table 10). The Er null model assigns links completely at random among all lizards and food items.

Table 10 Nestedness for all seasons networks

Name of network	N-total	NODF(Er)	P(Er)	NODF(Ce)	P(Ce)
Na Moltona all seasons	10.77	6.57	0.00	8.21	0.01
Na Guardis all seasons	10.22	7.48	0.00	8.93	0.14

Modularity

The modularity analysis gave significant results for both islets, i.e. both sites had a network, which was modular in its link structure. The modularity level on Na Moltona was $M = 0.59$, and mean ± SD for the 100 radomizations was 0.56 ± 0.016.

The modular structure of Na Moltona is shown in Appendix 20. Likewise for Na Guardis, the modularity level was $M = 0.61$ and mean ± SD was 0.58 ± 0.024. Its modular structure is described in Appendix 21.

Na Moltona

Nine modules were found in the all season network from Moltona. All individuals caught on Na Moltona belonged to a module. The ratio between number of lizard individuals and food items was 93:37 = 2.51. However, this ratio varied from 1.43 to 15.00 among the nine modules in the network.The content of each module is listed below. Numbering of modules follows the output from the program, i.e. some numbers might be missing. Separate figures are shown for the first six modules (Figures 7–11).

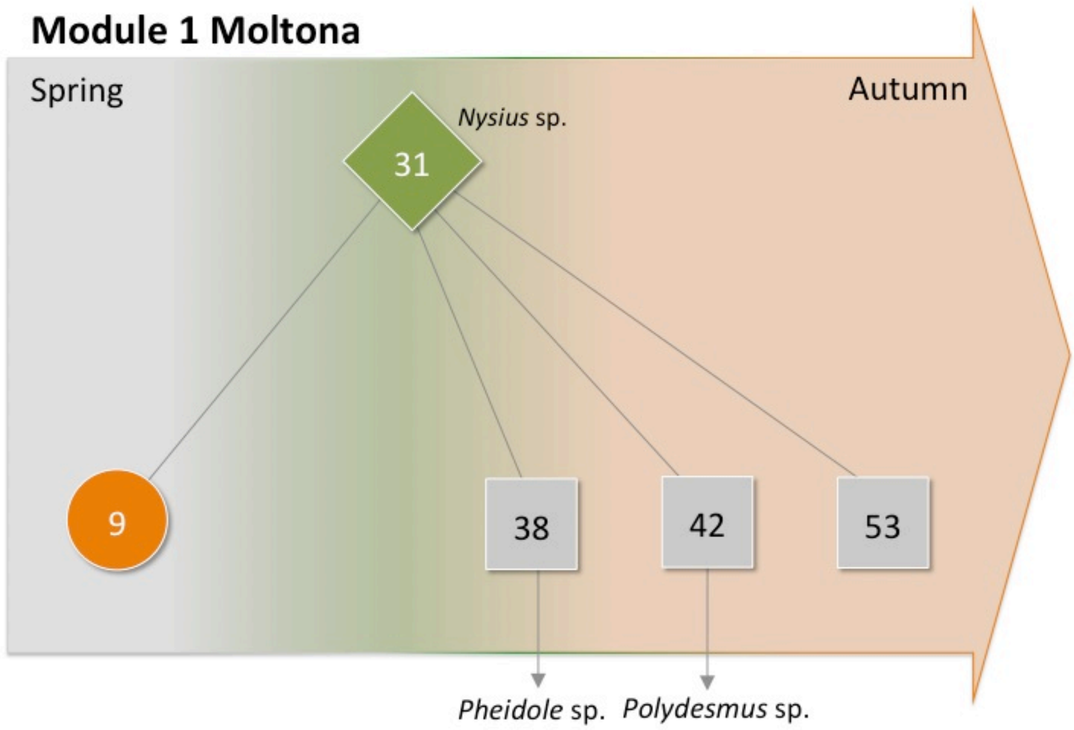


Figure 7. Module 1: Consisted of four individuals: three males (grey squares) and one female (orange circle. One kind of food item (green diamond) was consumed in this module: a true bug (*Nysius* sp.)

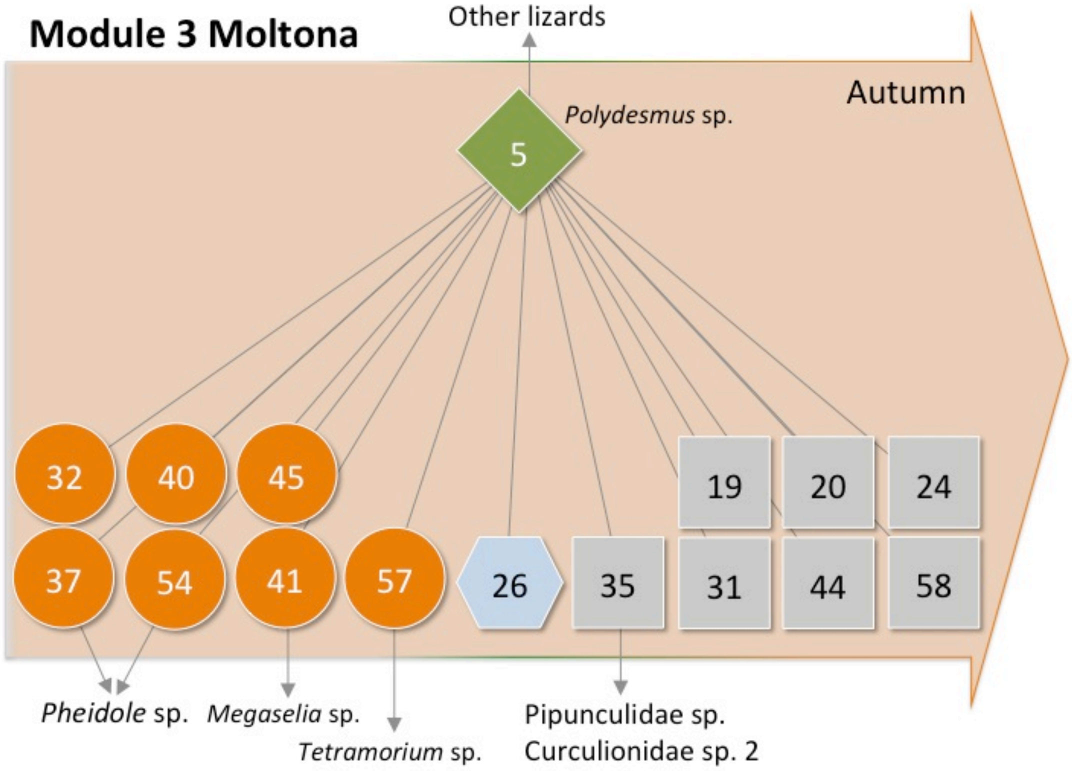


Figure 8. Module 3: Consisted of 15 individuals: seven males, seven females and one juvenile (blue polygon) . One kind of food item was consumed in this module: an armored millipede (*Polydesmus* sp.).

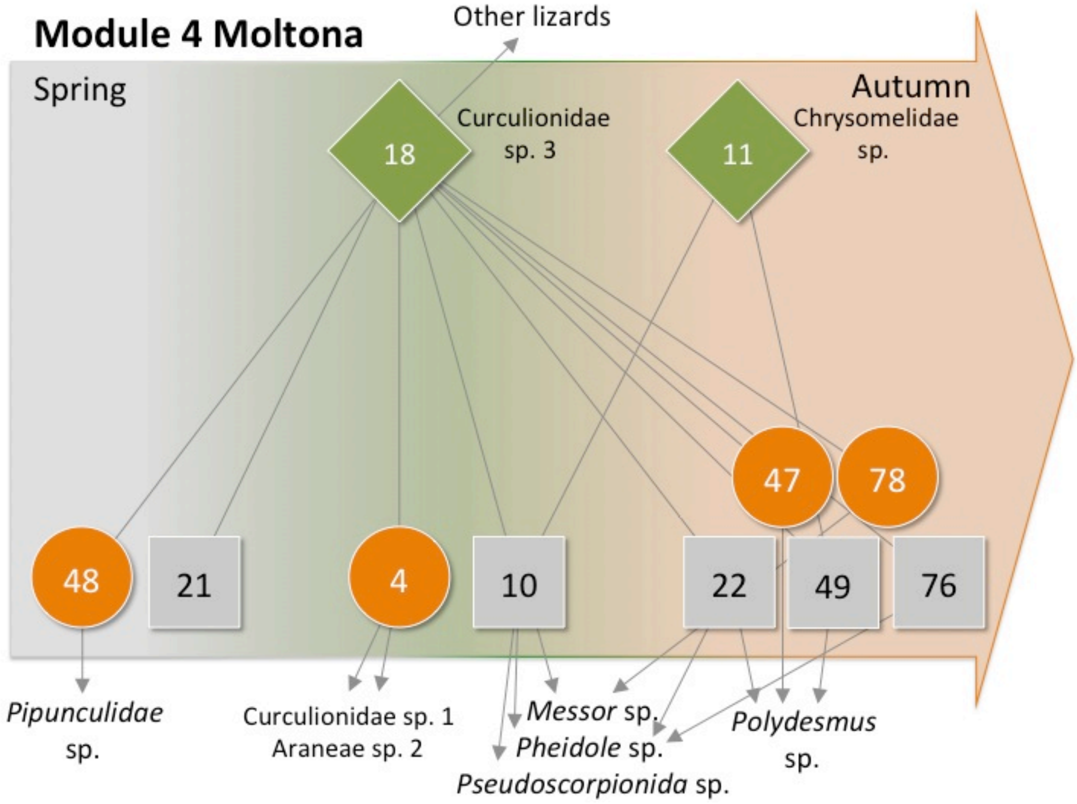


Figure 9. Module 4: Consisted of nine individuals: five males, four females. Two kinds of food items were consumed in this module: a leaf beetle (Chrysomelidae sp.) and a weevil (Curculionidae sp. 3).

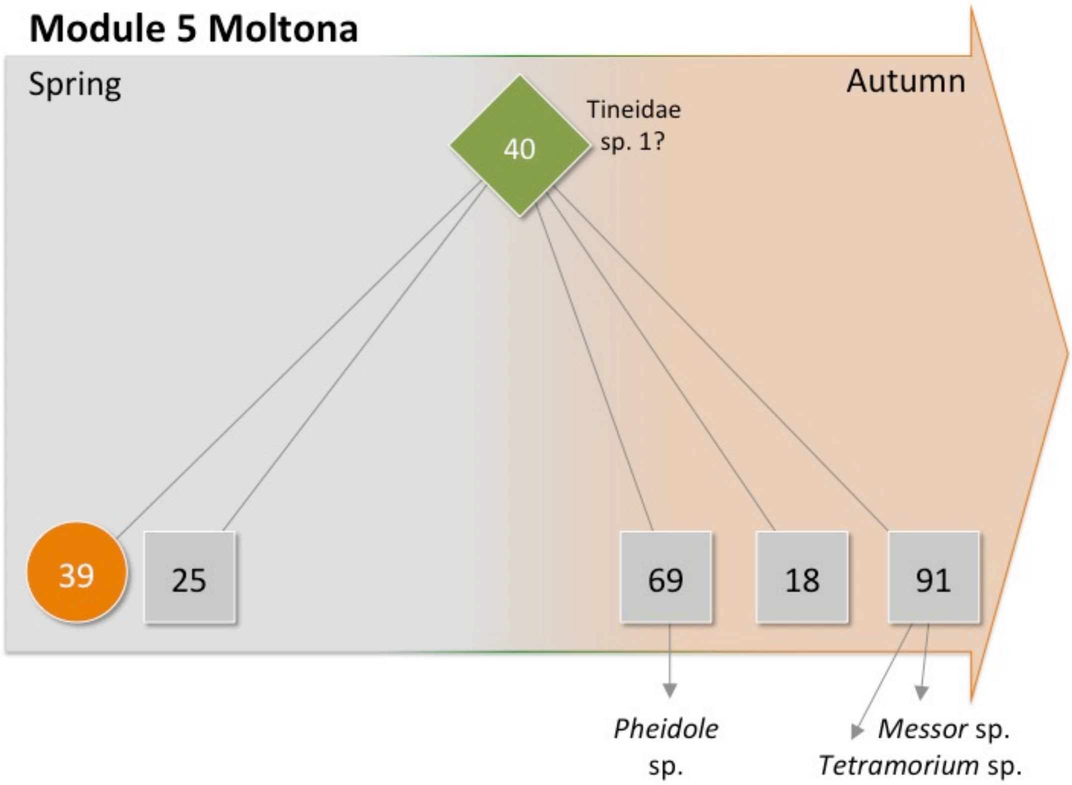


Figure 10. Module 5: Consisted of five individuals: four males and one female. One kind of food item was consumed in this module: a larva of a moth (Tineidae sp. or Geometridae sp.).

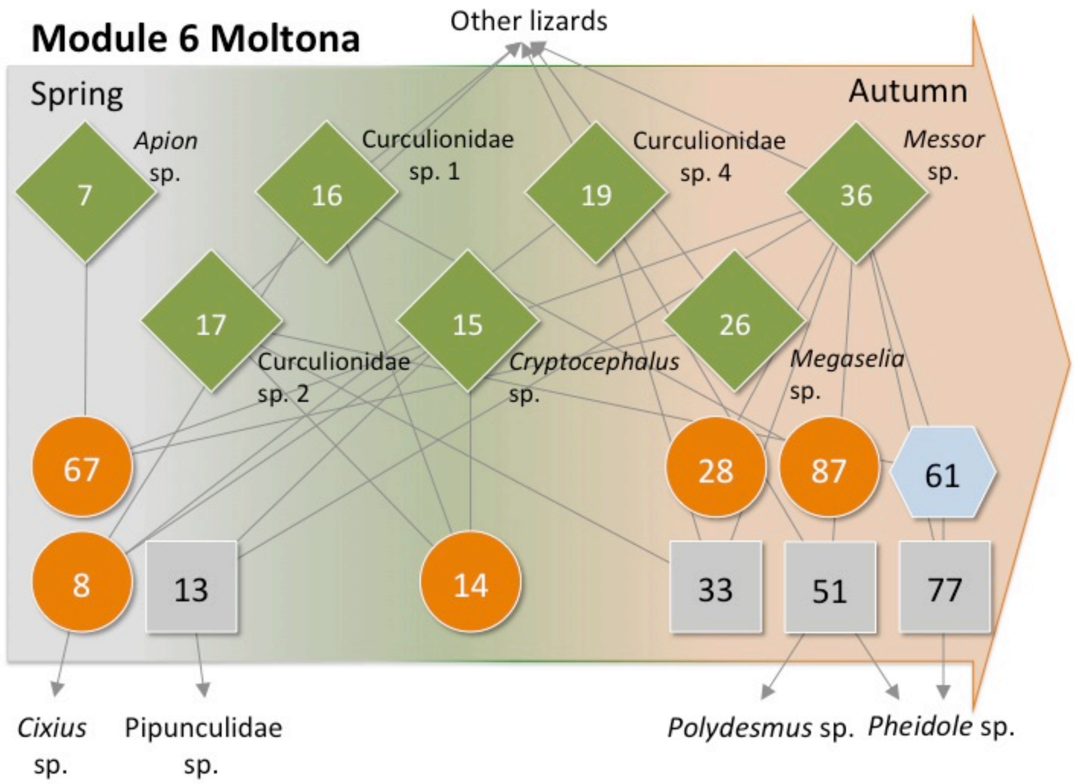


Figure 11. Module 6: Consisted of ten individuals: four males, five females and one juvenile. Seven food items were consumed in this module: a weevil (*Apion* sp.), a leaf beetle (*Cryptocephalus* sp.), three species of weevils (Curculionidae sp. 1, 2 and 4), a humpbacked fly (*Megaselia* sp.) and an ant (*Messor* sp.).

In addition, the network included the following modules:

Module 7 Consisted of seven individuals: three males, three females and one juvenile. Three food items were consumed in this module: a house pseudoscorpion (Pseudoscorpionida sp.), a rove beetle (Staphylinidae sp. 3) and a bee (*Lasioglossum* sp.).

Module 8 Consisted of 15 individuals: nine males, five females and one juvenile. Six food items were consumed in this module: a sac spider (Araneae sp. 2), a pill beetle (Byrrhidae sp.), a skin beetle (*Aphthona* sp.), a sawfly, wasp, bee or ant (Hymenotera sp. 1), a pupa of a moth (Tineidae sp. or Geometridae sp. 2) and one kind of seed was found (*Rubia peregrina*).

Module 9 Consisted of 18 individuals: ten males, six females and two juveniles. Nine food items were consumed in this module: a leaf beetle (*Bruchidius* sp.), a big-headed fly (Pipunculidae sp.), a minute black scavenger fly (Scatopsidae sp.), a planthopper (*Cixius* sp.), two species of ants (*Crematogaster scutellaris* and *Tetramorium* sp.), two snails (*Cochlicella acuta* and *Eobania vermiculata*), and a predator snail (*Rumia decollata*).

Module 10 Consisted of ten individuals: four males, five females and one juvenile. Seven food items were consumed in this module: a soft-wing flower beetle (*Psilothrix* sp.), two species of rove beetles (Staphylinidae sp. 1 and 2), a sawfly, wasp, bee or ant (Hymenoptera sp. 2), an ant (*Pheidole* sp.), a katydid (*Phanerotera nana*) and one species of seed was found (unidentified seed 1).

Na Guardis

Seven modules were found in the all–season network on Na Guardis. All individuals caught on Na Guardis belonged to a module, except one male and one female. The male individuals did not consume anything, whereas the female individuals were found to consume a planthopper (*Cixius* sp.).

Module 1 Consisted of six individuals, all males. Seven food items were consumed in this module: a millipede (*Julus* sp.), a leaf beetle (*Aphthona* sp.), a weevil (Curculionidae sp. 3), a minute black scavenger fly (Scatopsidae sp.), a larva of a moth (Tineidae sp. or Gemetridae sp. 2), a snail (*Eobania vermiculata*) and one species of seed was found (unidentified seed 2).

Module 2 Consisted of five individuals: three males, one females and one juvenile. Four food items were consumed in this module: a rove beetle (Staphylinidae sp. 4), a small earwig (*Labia* sp.), a snail (*Cochlicella acuta*) and one species of seed was found (*Rubia peregrina*).

Module 3 Consisted of 14 individuals: seven males, six females and one juvenile. Five food items were consumed in this module: a house pseudoscorpion

(Pseudoscorpionida *sp.*), two weevils (*Apion sp.* and Curculionidae sp. 1) and two species of ants (*Messor* sp. and *Pheidole* sp.).

Module 4 Consisted of three individuals: one male and two females. Six food items were consumed in this module: two species of sac spiders (Araneae sp. 1 and 2), a ground beetle (Carabidae sp.), a skin beetle (*Anthrenus* sp.), a leaf beetle (*Bruchus* sp.) and a weevil (Curculionidae sp. 4).

Module 5 Consisted of 11 individuals: six males and five females. Seven food items were consumed in this module: a pill beetle (Byrrhidae sp.), two species of weevils (Curculionidae sp. 2 and 5), a beach fly (*Tethina* sp.), a true bug (*Nysius* sp.), an ant (*Tetramorium* sp.) and one species of seed was found (unidentified seed 1).

Module 6 Consisted of five individuals: three males and two juveniles. Five food items were consumed in this module: a leaf beetle (Chrysomelidae sp.), a rove beetle (Staphylinidae sp. 1), a humpbacked fly (*Megaselia* sp.), a big-headed fly (Pipunculidae sp.) and a bee (*Lasioglossum* sp.).

Module 7 Consisted of seven individuals: one male and six females. Two food items were consumed in this module: an armored millipede (*Polydesmus* sp.) and a rove beetle (Staphylinidae sp. 2).

DISCUSSION

Nature is organized in hierarchies. Together individuals constitute populations, which again constitute species. How different hierarchical levels affect each other are to my knowledge not well known. An understanding of this interplay between different hierarchical levels such as species and individuals is important if we want to know which level is the drivers of network structure and dynamics (Olesen *et al.* 2010).

However, many real networks are somewhere between the species and the individual level, because the less sampled a species-species network is the more it is an individual-individual network. This is due to the representation of several species in a poorly–sampled network, by just one individual, so called singletons, e.g. in another study 23 % of the interactions in an arctic network was based on singletons, although this was sampled for two entire seasons (Olesen *et al.* 2008). If other networks are screened (database supplied by JM Olesen), for which counts of individuals are available, the same is true for these as well. Thus maybe no network studied can really be called a species-species network.

The networks in this study were "individual lizard-higher taxon food item networks", i.e. networks consisting of two interacting communities: a community of individual lizards and a community of food items, sorted out to different taxonomic levels, i.e. to species, genus etc. and some of the food items were only represented once, reducing them to individual representatives. This latter fact means that the food item cannot tell us anything about how the species, which the individual belongs to, is consumed, because all other items of that food category might be consumed by other lizard individuals.

The networks studied here are in their nature similar to most social networks, consisting of individuals interacting with a set of events, phenomena or other entities in their environment. It can thus be expect that individual lizards might show somewhat similar behavior as for example humans do in their networks. This means that lizards genetically related may group together in the same modules, i.e. a male, some females and their young, or lizards belonging to the same size, gender, habitat patch, age (Bolnick *et al.* 2003, Araújo *et al.* 2011), behavior (Bolnick *et al.* 2003, Madden *et al.* 2011, Dall *et al.* 2012), and social status (Madden *et al.* 2011).

Consequently, such individual networks of lizards vary in space and time. In order to show to what extent this is true, the network behavior was studied for lizards on two islands and over different seasons. Comparing networks made for the different censuses/seasons shows that these were very different. Individuals involved in the different networks were almost all unique, i.e. very few individuals were observed more than once. Thus a very strong seasonal dynamics is to be expected.

Dietary analysis

The study of diet is relevant to the study of species ecology (Pérez-Mellado *et al.* 2011). In studies of diets of reptiles four methods are available: analyzing stomach/digestive tracts of dead individuals, stomach flushing, fecal sampling and foraging observation. The most common method is stomach/digestive tract analyses, however this method may not be ethically correct due to the scarification of individuals. Other factors like conservation status may favor another method. In this study, fecal samples were used due to the endangered status of *Podarcis lilfordi*. The quality of fecal samples compared to stomach/digestive tract analysis is, however, a controversial point among scientists. Some state that soft-bodied prey such as larvae and spiders, will be destroyed doing the digestion and therefore not represented in the fecal samples (Pérez-Mellado *et al.* 2011). However, both larvae and spiders were found in this diet study and the same is true for other studies, which analysed fecal samples (e.g. Pérez-Mellado and Corti 1993, Pérez-Mellado *et al.* 2011). Larvae and spiders were a minor part of the diet in this study, and it cannot be excluded that some of this soft-bodied prey had been destroyed doing the digestion. However, Pérez-Mellado *et al.* (2011) found a higher or equal proportion of soft-bodied prey in fecal samples as in in stomach/digestive tract analysis, which may indicate that fecal sampling may be as good as stomach/digestive tract analysis (Pérez-Mellado *et al.* 2011).

In this study, 47 different invertebrate species were found to be consumed by different lizard individuals on the two studied islets, Na Moltona and Na Guardis. All orders which were consumed were also found in another *P. lilfordi* diet study by Pérez-Mellado and Corti (1993), except for one order, Orthoptera. Orthoptera, however, was only found to be consumed once on Na Moltona. Other orders, suborders, classes and subclasses were consumed in the other diet study as well, but some variation may be expected due to differences between study sites and populations differences. Nearly all invertebrate species were insects, which is typical for the *P. lilfordi* diet (Pérez-Mellado and Corti 1993, Brown and Pérez-Mellado 1994).

The most consumed order in this study was Coleoptera, where over 50 % of the species eaten were from the family Curculionidae. Pérez-Mellado and Corti (1993) also found Coleoptera to be one of three main orders (Coleoptera, Hymenoptera, and Hemiptera) to be consumed with Curculionidae being the most frequent family. However, in their study, the family Formicidae (order Hymenoptera) was the most consumed overall, which also was observed in another study by Brown and Pérez-Mellado (1994). In this study, Hymenoptera was the second most consumed order and over 80 % of the species were from the ants, the family Formicidae. The last major order found by Pérez-Mellado and Corti (1993), Hemiptera, was also found here, however, the suborder Homoptera made up the main part of the diet in their study, which was not represented in this study. The order Hemiptera made up a minor part of the diet for *P. lilfordi* on both Na Moltona and Na Guardis.

The observation of many ants (Formicidae) in the diet of *P. lilfordi* may be surprising because of the low energy content in ants. However, the reason for the high consumption can be due to the clumped distribution of ants in colonies (Pérez-Mellado and Corti 1993).

Comparing the diet of *P. lilfordi* to a closely related species from the mainland shows both similarities and differences. Castilla *et al.* (1991) examined the diet of *Lacerta lepida* from Central Spain, which showed that Coleoptera was the main consumed order as in this study. However, the families consumed in Coleoptera differed, which can be due to different availability of prey in the different habitats. The most noteworthy, however, is the observation that Formicidae was rarely consumed in the mainland species.

In this study, seeds were not found to be a major part of the diet of *P. lilfordi*. However, other studies (e.g. Pérez-Melloda and Corti 1993, Brown and Pérez-Mellado 1994) had found plant material to constitute a considerable part of the lizard's diet. Pérez-Mellado and Corti (1993) observed that fruit pulp was a main plant material component in the diet, but also leaves/soft stems, seeds, flowers and pollen/nectar were frequently found. In this study, only seeds were encountered, however, a few leaves/soft stems were observed and some of the seeds still contained fruit pulp, when examined (only seeds from *Rubia peregrine*). Seeds were found in spring, summer and autumn in samples from Na Guardis, but only in autumn in samples from Na Moltona. Pérez-Mellado and Corti (1993) found most plant material in summer, which may be due to dry summers with limit arthropod availability and more fruits. In this study arthropod level was also lowest in the summer period. However, it was also the period with fewest samples.

The observation of both invertebrate species and plant material in the diet of *P. lilfordi* is indicative of omnivory, which is supported by a study made by Herrel *et al.* (2004). Many lacertid lizards are omnivore species and have evolved some specializations in relation to that, such as longer intestinal tract and tooth shape, but not an increase in body size as usually seen in herbivorous species (Herrel *et al.* 2004).

Nestedness

The published list of studies focusing upon the behavior of individuals in a network context is still short. A recently published paper by Tur *et al.* (on line) reported the behavior of individual pollinators belonging to different species and their interactions with different species of flowering plants. This was done by collecting representatives of all pollinator species, washing their bodies in alcohol and identifying all the pollen grains preferable to species. Thus this network was an individual pollinator-plant species networks. By pooling all the individuals of the same species the authors also made a species-species network making a comparison to the pollinator individual and the species level possible. They observed that the individual-species networks were less nested than species-species networks. The reason for this difference is uncertain, but perhaps individuals choose pollen sources different from those chosen by other individuals, i.e. they show an idiosyncratic behavior. This may reduce nestedness, because in a nested network individuals choose a diet that is a subset of what other individuals consume. This cannot be tested in this study because here I only operated with one species. However, for the all–season networks studied here, the network from Na Moltona was significantly nested whereas the network from Na Guardis was not.

Consider food item importance in the network structure, their abundance may be an important factor (Pires *et al.* 2011). I would expect that the most abundant food item will be consumed by many lizard individuals, whereas the more rare food items would be consumed by fewer individuals. Especially, if the common food item is preferred by all lizards and the rare items are of a lower quality and only eaten by lizards low in the dominance hierarchy. Thus the food items should force the network to become nested. If this is not the case, then different food items are preferred by different lizard individuals and one could imagine that the largest individual chooses the richest source and other individuals have to differentiate out and monopolize other food items. If so, I would expect a more equal body size of lizards in the non-nested network (Na Guardis), and a more strongly skewed body size distribution in the nested one (Na Moltona). A tendency towards this is seen when looking at the distribution of lizard individual weight and length of the different individuals caught in this study. The difference in weight between the smallest and the largest individual on Na Moltona was 11.2 g for males, 5.8 g for females and 6.9 g for juveniles, whereas it was only 3.7 g for males, 2.9 g for females and 5.5 g for juveniles on Na Guardis. The differences in length between the two islets is not as big as the differences in weight, however, for males and juveniles the length between the shortest and longest individual is larger on Na Moltona than on Na Guardis, whereas the difference is the same for females on both islets. Thus a non-nested link pattern suggests that individuals reduce negative effects of intraspecific competition by hunting food not used by other individuals (e.g. Svanbäck & Bolnick 2007). However, the preference for different resources could also be due to the different requirement for different individuals, e.g. the need of a more protein-rich resource for growing individuals.

In a nested network, high cohesion will be expected due to the dense core of individuals using many resources and resources which are most often included in the individual's diet (Bascompte *et al.* 2003). In the all–seasons networks analyzed in this study, cohesion level for the nested and non-nested network was the same (average degree for Na Moltona 3.0 links and average degree for Na Guardis 2.9 links).

Modularity

Modularity may contribute to the complexity of an ecological network (Olesen *et al.* 2007). Within a population, individuals can form groups or modules, which consist of individuals specialized in a particular resource (Araújo *et al.* 2010). Individual specialization can be explained, as shortly mentioned earlier, by three scenarios according to the foraging theory (Araújo *et al.* 2011): (1) The optimal diet may vary between individuals in a population due to phenotypic variation (Bolnick *et al.* 2003, Araújo *et al.* 2011, Madden *et al.* 2011, Dall *et al.* 2012), which may give variation in e.g. prey detection, prey capture and digestion; (2) optimization criteria may differ between individuals, i.e. some may minimize predation risk while others take more risk to maximize energy input. Further the criteria can be due to different physiological requirements between sexes and individuals at different ages such as reproduction, nursing or growth (Bolnick *et al.* 2003, Araújo *et al.* 2011, Madden *et al.* 2011); and (3) the social status of individuals may influence their ability to optimize their diet (Araújo *et al.* 2011, Madden *et al.* 2011). Point 3 may reflect one of the most described reasons for individual specialization, viz. intraspecific competition. Intraspecific competition is said to increase the individual niche width and this is supported by several studies (Svanbäck and Bolnick 2007, Araújo *et al.* 2008, 2011, Svanbäck *et al.* 2011). However, individual specialization may also occur due to the absence or lowering of interspecific competition (Bolnick *et al.* 2003, Svanbäck *et al.* 2011), resource densities (Svanbäck *et al.* 2011), and sharing of the same habitat patch (Bolnick *et al.* 2003, Araújo *et al.* 2011).

Both Na Moltona and Na Guardis showed modularity. However, individuals in the same module did not have the same sex, age or size. This picture was also seen in another study for a closely related species (*Lacerta lepida*) made by Castilla *et al.* (1991).

When modularity cannot be ascribed to differences in sex, ages, size and social status, another possible reason is described by Araújo *et al.* (2010). The reason could be the different experiences which individuals have gained in relation to resource use. An individual may have a limit to how much information it can handle, therefore an individual's learning of where to find a resources and how to capture or handle it may have a threshold. Araújo *et al.* (2010) points out that individual specialization also could be digestively related. A resource may require some digestive conditions and each individual can have evolved some favorable conditions for some resources and then specialized on these.

Perspectives for future studies

To optimize the diet study for *P. lilfordi* e.g. on Na Moltona and Na Guardis some changes and related studies could be considered. The active period of the lizard individuals could be taking into account according to the sampling of feces for maximizing the number of samples and the content of food items in the samples. Larger networks would be preferred due to more reliable results. Further plants could be collected when their fruit was available and then analyzed and stored to compare them which seeds in the lizards' diet. Analysis of all available invertebrates and their abundance could also contribute to a more detailed study.

CONCLUSION

The individual level in network analysis is very important. In this study it has been showed that the individual food niche differs much from the population food niche.

As expected *P. lilfordi* consumed both invertebrates and plant material. However, the plant material was a minor part of the diet and lower than plant material found in the diet of other *P. lilfordi* populations and the expectations for an island population. This may be due to the sampling periods. Other studies found most plant material in the diet during summer where the availability of arthropods was quite low, which was a period only poorly represented in this study.

Analyses of networks for all seasons together for the two islets, Na Moltona and Na Guardis, gave different results. The network from Na Moltona was nested and showed modularity, whereas the network from Na Guardis was not nested but showed modularity. These differences may reflect important differences in population structure and foraging behaviour on the two islets. The differences in nestedness can be due to different conditions on the two islets, e.g. in sizes between individuals. On Na Moltona, individuals differed much in body size, which can explain the nested pattern of the network. On Na Guardis the body size did not differed so much, which can explain the non-nested pattern because individuals has become more generaliszed and differed in their resource use by having different food niches.

The pattern of modularity on both islets could not be explained by grouping of the same sex, age, or size. However, one of the most described reasons for individual specialization is intraspecific competition, which could be the reason for the modules, especially on Na Guardis, because of its non-nested pattern.

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Appendix 1. All lizards–food item interaction matrix.

Na Moltona Food items

			94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119
			I2	I3	I5	I7	I8	I9	I10	I11	I13	I15	I16	I17	I18	I19	I21	I22	I23	I26	I27	I29	I30	I31	I32	I33	I34	I35
1	**All lizards**	M1																										
2		M2		1															1									
3		M4	1										1		1													
4		M5																										
5		M6																			1							
6		M8											1	1		1												
7		M9																						1				
8		M10		1						1					1													
9		M11		1																								
10		M12																			1							
11		M13												1							1							
12		M14										1	1	1						1								
13		M15					1		1																			
14		M16															1											
15		M17		1												1												
16		M18																										
17		M19			1																							
18		M20			1																							
19		M21													1													
20		M22			1										1													
21		M23						1									1											
22		M24			1																							
23		M25																										
24		M26			1																							
25		M27																				1						
26		M28																										
27		M29																										
28		M30																				1						
29		M31			1																							
30		M32			1																							
31		M33												1		1												
32		M34												1			1											
33		M35			1									1							1							
34		M36																										
35		M37			1																							
36		M38																						1				
37		M39																										
38		M40			1																							
39		M41			1															1								
40		M42			1																			1				

41	M43																										
42	M44			1																							
43	M45			1																							
44	M46			1											1					1							
45	M47			1										1													
46	M48													1						1							
47	M49			1					1					1													
48	M50																			1							1
49	M51			1											1												
50	M52		1	1																							
51	M53																						1				
52	M54			1																							
53	M55														1												
54	M56			1																1							
55	M57			1																							
56	M58			1																							
57	M60			1																					1		
58	M61												1														
59	M62									1										1	1						
60	M63																					1					
61	M64																			1	1	1					
62	M65																			1		1					
63	M66																			1							1
64	M67				1														1			1					
65	M68																					1					
66	M69																										
67	M71															1											
68	M72																										
69	M73																										
70	M74		1															1								1	
71	M75																										
72	M76													1													
73	M77																										
74	M78													1													
75	M79																							1			
76	M80												1							1				1			
77	M81																	1		1							
78	M82													1							1	1					
79	M83																										
80	M84																										
81	M85	1																									
82	M86			1													1										
83	M87											1															
84	M88																										

85	M89	1																									
86	M90																1										
87	M91																										
88	M92																										
89	M93																										
90	M94					1																					
91	M95											1															
92	M96																									1	
93	M97																			1							

120	121	122	123	124	125	126	127	128	129	130
I36	I37	I38	I40	I41	I42	I43	I45	I47	I48	I49
		1								
	1									
	1					1				
1	1									
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Appendix 2. Lizard male–food item interaction matrix.

Na Moltona **Food items**

		I3	I5	I8	I10	I11	I13	I16	I17	I18	I19	I21	I22	I23	I27	I29	I30	I31	I32	I33	I34	I36	I37
Males	M6														1								1
	M10	1				1				1												1	1
	M11	1																					
	M12														1								1
	M13								1						1							1	
	M15			1	1																		
	M18																						
	M19		1																				
	M20		1																				
	M22		1							1													1
	M24		1																				
	M25																						
	M27															1							
	M29																						
	M30															1							
	M31		1																				
	M33								1		1											1	
	M35		1						1						1								
	M38																	1					1
	M42		1															1					
	M43																						
	M44		1																				
	M49		1			1				1													
	M51		1								1											1	1
	M53																	1					
	M55										1												1
	M56		1												1								
	M58		1																				
	M60		1																	1			1
	M62						1								1	1							
	M68																1						
	M69																						1
	M71											1											
	M72																						
	M74	1												1							1		1
	M76									1													1
	M77																					1	
	M79																		1				1
	M81													1	1								
	M83																						
	M84																						
	M86		1										1										1
	M91																					1	
	M92																						
	M93																						
	M95							1															
	M97														1								

I38	I40	I41	I43	I45	I47	I48	I49
			1				
			1				
	1						
	1						
				1			
1			1				
1			1				
				1			
							1
1			1				
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		1					
1	1						
						1	
		1				1	
						1	
1							

Appendix 3. Lizard female–food item interaction matrix.

Na Moltona **Food items**

		I2	I3	I5	I7	I8	I9	I15	I16	I17	I18	I19	I21	I22	I26	I27	I29	I30	I31	I34	I35	I36	I37	I38	I40	I41
Females	M1																							1		
	M4	1							1		1															
	M8								1	1		1														
	M9																		1							
	M14							1	1	1					1											
	M16												1										1			
	M17		1									1														
	M21										1															
	M23						1						1										1			
	M28																					1				
	M32			1																						
	M34									1			1										1			
	M36																						1			
	M37			1																			1			
	M39																								1	
	M40			1																						
	M41			1											1											
	M45			1																						
	M46			1								1				1								1		
	M47			1							1															
	M48										1					1										
	M50															1					1					
	M52		1	1																						
	M54			1																			1			
	M57			1																				1		
	M65															1		1								
	M66															1					1			1		
	M67				1										1			1				1				
	M73																						1			
	M75																									
	M78										1											1				
	M82										1						1	1								
	M85	1																								1
	M87								1																	
	M88																									
	M89	1																				1				
	M90													1												
	M94					1																				
	M96																			1						

I42	I43	I47	I48	I49
1				
	1			
			1	
		1		
			1	
		1		
			1	
			1	
				1
			1	

Appendix 4. Lizard juvenile–food item interaction matrix.

Na Motona	**Food items**	I3	I5	I17	I23	I27	I29	I30	I32	I36	I37	I38	I47
Juveniles	M2	1			1								
	M5										1		
	M26		1										
	M61			1						1	1		
	M63							1					
	M64					1	1	1				1	1
	M80			1		1			1				

Appendix 5. All lizards–food items interaction matrix.

	Na Guardis	**Food items**	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
			I1	I2	I3	I4	I5	I6	I7	I8	I10	I11	I12	I14	I16	I17	I18	I19	I20	I21	I22	I24	I25	I26	I27	I28	I29	I30	I31	I34	I36	I37	I38
1	**All seasons**	G1					1																													
2		G2																			1												
3		G3																													1	1	
4		G4						1			1																						
5		G5												1		1																1	
6		G6	1	1	1						1			1				1													1		
7		G7																						1	1					1			1
8		G8																													1		
9		G9								1																						1	1
10		G10													1																		
11		G11																1															1
12		G12								1						1										1			1				
13		G13										1													1								
14		G15												1								1											
15		G16																															
16		G17														1																	1
17		G18														1									1								
18		G19			1																											1	
19		G20				1									1		1										1				1		
20		G21			1																												
21		G22																													1	1	
22		G23																									1						
23		G24														1													1				1
24		G25																															1
25		G26								1																							
26		G27													1																	1	1
27		G28			1																											1	
28		G29			1										1																		
29		G30														1																1	
30		G31																				1											
31		G32																		1										1			
32		G33														1																	
33		G34					1																								1		
34		G35					1										1										1						
35		G36													1																1		
36		G37					1																										
37		G38					1																										
38		G39					1														1												
39		G40																				1											
40		G41														1																	

41	G42					1										1	1
42	G43															1	
43	G44		1														
44	G45		1		1		1					1	1				
45	G46															1	
46	G47											1	1		1		
47	G48									1							
48	G49											1	1				
49	G50	1		1													
50	G51						1		1								
51	G52													1			
52	G53							1			1		1				

84	85	86	87	88	89
I40	I43	I45	I48	I49	I50
1	1				
			1		
				1	
	1				
			1		
				1	
1					
		1			
			1		
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Appendix 6. Lizard male–food item interaction matrix

Na Guardis **Food items**

Males	I1	I2	I3	I4	I5	I8	I10	I11	I12	I14	I16	I17	I18	I19	I21	I24	I25	I26	I27	I28	I29	I31	I34	I36	I37
G3																								1	1
G6	1	1	1				1			1				1										1	
G7																		1	1				1		
G9						1																			1
G11														1											
G12						1						1								1		1			
G13								1											1						
G15										1						1									
G20				1							1		1								1			1	
G21			1																						
G22																								1	1
G23																					1				
G25																									
G27											1														1
G28			1																						1
G30												1													1
G31																1									
G32															1								1		
G35					1								1								1				
G41												1													
G43																								1	
G44					1																				
G45					1				1			1							1		1				
G46																								1	
G48																	1								
G49																			1		1				
G53													1					1			1				

I38	I40	I43	I45	I48	I49	I50
1	1	1				
1				1		
1					1	
		1				
	1					
			1			
1						
1						
				1		
				1		
	1		1			1
			1			
			1			
		1				
			1			
			1			

Appendix 7. Lizard female–food item interaction matrix.

Na Guardis **Food items**

Females

	I3	I5	I6	I7	I8	I10	I14	I16	I17	I20	I22	I24	I30	I31	I36	I37	I38	I40	I45	I49
G1		1																		
G2											1									
G4			1			1														
G5							1		1							1				
G8															1					
G10								1												
G17									1								1			1
G19	1															1				
G24									1					1			1			
G26					1															
G29	1							1										1		
G33									1											
G34		1													1					
G36								1							1					
G37		1																		
G38		1																		
G39		1									1									
G40												1								
G50	1			1															1	
G51									1	1										
G52													1							

Appendix 8. Lizard juvenile–food item interaction matrix.

Na Guardis **Food items**

		I16	I17	I27	I29	I34	I36	I37	I48
Juveniles	G16								1
	G18		1	1					
	G42	1					1	1	
	G47			1	1	1			

Appendices 9–16

Input files to Pajek

1 Na Moltona all

2 Na Moltona males

3 Na Moltona females

4 Na Moltona juveniles

5 Na Guardis all

6 Na Guardis males

7 Na Guardis females

8 Na Guardis juveniles

```
*vertices 130 93
1 "M1" "diamond" ic Blue
2 "M2" "diamond" ic Blue
3 "M4" "diamond" ic Blue
4 "M5" "diamond" ic Blue
5 "M6" "diamond" ic Blue
6 "M8" "diamond" ic Blue
7 "M9" "diamond" ic Blue
8 "M10" "diamond" ic Blue
9 "M11" "diamond" ic Blue
10 "M12" "diamond" ic Blue
11 "M13" "diamond" ic Blue
12 "M14" "diamond" ic Blue
13 "M15" "diamond" ic Blue
14 "M16" "diamond" ic Blue
15 "M17" "diamond" ic Blue
16 "M18" "diamond" ic Blue
17 "M19" "diamond" ic Blue
18 "M20" "diamond" ic Blue
19 "M21" "diamond" ic Blue
20 "M22" "diamond" ic Blue
21 "M23" "diamond" ic Blue
22 "M24" "diamond" ic Blue
23 "M25" "diamond" ic Blue
24 "M26" "diamond" ic Blue
25 "M27" "diamond" ic Blue
26 "M28" "diamond" ic Blue
27 "M29" "diamond" ic Blue
28 "M30" "diamond" ic Blue
29 "M31" "diamond" ic Blue
30 "M32" "diamond" ic Blue
31 "M33" "diamond" ic Blue
32 "M34" "diamond" ic Blue
33 "M35" "diamond" ic Blue
34 "M36" "diamond" ic Blue
35 "M37" "diamond" ic Blue
36 "M38" "diamond" ic Blue
37 "M39" "diamond" ic Blue
38 "M40" "diamond" ic Blue
39 "M41" "diamond" ic Blue
40 "M42" "diamond" ic Blue
41 "M43" "diamond" ic Blue
42 "M44" "diamond" ic Blue
43 "M45" "diamond" ic Blue
44 "M46" "diamond" ic Blue
45 "M47" "diamond" ic Blue
46 "M48" "diamond" ic Blue
47 "M49" "diamond" ic Blue
48 "M50" "diamond" ic Blue
49 "M51" "diamond" ic Blue
50 "M52" "diamond" ic Blue
51 "M53" "diamond" ic Blue
52 "M54" "diamond" ic Blue
53 "M55" "diamond" ic Blue
54 "M56" "diamond" ic Blue
55 "M57" "diamond" ic Blue
56 "M58" "diamond" ic Blue
57 "M60" "diamond" ic Blue
58 "M61" "diamond" ic Blue
59 "M62" "diamond" ic Blue
60 "M63" "diamond" ic Blue
61 "M64" "diamond" ic Blue
62 "M65" "diamond" ic Blue
63 "M66" "diamond" ic Blue
64 "M67" "diamond" ic Blue
65 "M68" "diamond" ic Blue
66 "M69" "diamond" ic Blue
67 "M71" "diamond" ic Blue
68 "M72" "diamond" ic Blue
69 "M73" "diamond" ic Blue
70 "M74" "diamond" ic Blue
71 "M75" "diamond" ic Blue
72 "M76" "diamond" ic Blue
73 "M77" "diamond" ic Blue
74 "M78" "diamond" ic Blue
75 "M79" "diamond" ic Blue
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76 "M80" "diamond" ic Blue
77 "M81" "diamond" ic Blue
78 "M82" "diamond" ic Blue
79 "M83" "diamond" ic Blue
80 "M84" "diamond" ic Blue
81 "M85" "diamond" ic Blue
82 "M86" "diamond" ic Blue
83 "M87" "diamond" ic Blue
84 "M88" "diamond" ic Blue
85 "M89" "diamond" ic Blue
86 "M90" "diamond" ic Blue
87 "M91" "diamond" ic Blue
88 "M92" "diamond" ic Blue
89 "M93" "diamond" ic Blue
90 "M94" "diamond" ic Blue
91 "M95" "diamond" ic Blue
92 "M96" "diamond" ic Blue
93 "M97" "diamond" ic Blue
94 "I2" "circle" ic Black
95 "I3" "circle" ic Black
96 "I5" "circle" ic Black
97 "I7" "circle" ic Black
98 "I8" "circle" ic Black
99 "I9" "circle" ic Black
100 "I10" "circle" ic Black
101 "I11" "circle" ic Black
102 "I13" "circle" ic Black
103 "I15" "circle" ic Black
104 "I16" "circle" ic Black
105 "I17" "circle" ic Black
106 "I18" "circle" ic Black
107 "I19" "circle" ic Black
108 "I21" "circle" ic Black
109 "I22" "circle" ic Black
110 "I23" "circle" ic Black
111 "I26" "circle" ic Black
112 "I27" "circle" ic Black
113 "I29" "circle" ic Black
114 "I30" "circle" ic Black
115 "I31" "circle" ic Black
116 "I32" "circle" ic Black
117 "I33" "circle" ic Black
118 "I34" "circle" ic Black
119 "I35" "circle" ic Black
120 "I36" "circle" ic Black
121 "I37" "circle" ic Black
122 "I38" "circle" ic Black
123 "I40" "circle" ic Black
124 "I41" "circle" ic Black
125 "I42" "circle" ic Black
126 "I43" "circle" ic Black
127 "I45" "circle" ic Black
128 "I47" "circle" ic Black
129 "I48" "circle" ic Black
130 "I49" "circle" ic Black
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0

```
*vertices 77 47
1 "M6" "box" ic Blue
2 "M10" "box" ic Blue
3 "M11" "box" ic Blue
4 "M12" "box" ic Blue
5 "M13" "box" ic Blue
6 "M15" "box" ic Blue
7 "M18" "box" ic Blue
8 "M19" "box" ic Blue
9 "M20" "box" ic Blue
10 "M22" "box" ic Blue
11 "M24" "box" ic Blue
12 "M25" "box" ic Blue
13 "M27" "box" ic Blue
14 "M29" "box" ic Blue
15 "M30" "box" ic Blue
16 "M31" "box" ic Blue
17 "M33" "box" ic Blue
18 "M35" "box" ic Blue
19 "M38" "box" ic Blue
20 "M42" "box" ic Blue
21 "M43" "box" ic Blue
22 "M44" "box" ic Blue
23 "M49" "box" ic Blue
24 "M51" "box" ic Blue
25 "M53" "box" ic Blue
26 "M55" "box" ic Blue
27 "M56" "box" ic Blue
28 "M58" "box" ic Blue
29 "M60" "box" ic Blue
30 "M62" "box" ic Blue
31 "M68" "box" ic Blue
32 "M69" "box" ic Blue
33 "M71" "box" ic Blue
34 "M72" "box" ic Blue
35 "M74" "box" ic Blue
36 "M76" "box" ic Blue
37 "M77" "box" ic Blue
38 "M79" "box" ic Blue
39 "M81" "box" ic Blue
40 "M83" "box" ic Blue
41 "M84" "box" ic Blue
42 "M86" "box" ic Blue
43 "M91" "box" ic Blue
44 "M92" "box" ic Blue
45 "M93" "box" ic Blue
46 "M95" "box" ic Blue
47 "M97" "box" ic Blue
48 "I3" "circle" ic Black
49 "I5" "circle" ic Black
50 "I8" "circle" ic Black
51 "I10" "circle" ic Black
52 "I11" "circle" ic Black
53 "I13" "circle" ic Black
54 "I16" "circle" ic Black
55 "I17" "circle" ic Black
56 "I18" "circle" ic Black
57 "I19" "circle" ic Black
58 "I21" "circle" ic Black
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66 "I33" "circle" ic Black
67 "I34" "circle" ic Black
68 "I36" "circle" ic Black
69 "I37" "circle" ic Black
70 "I38" "circle" ic Black
71 "I40" "circle" ic Black
72 "I41" "circle" ic Black
73 "I43" "circle" ic Black
74 "I45" "circle" ic Black
75 "I47" "circle" ic Black
```

```
76 "I48" "circle" ic Black
77 "I49" "circle" ic Black
*Matrix
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0
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1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
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0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0
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1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0
0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
```

```
*vertices 69 39
1 "M1" "triangle" ic Blue
2 "M4" "triangle" ic Blue
3 "M8" "triangle" ic Blue
4 "M9" "triangle" ic Blue
5 "M14" "triangle" ic Blue
6 "M16" "triangle" ic Blue
7 "M17" "triangle" ic Blue
8 "M21" "triangle" ic Blue
9 "M23" "triangle" ic Blue
10 "M28" "triangle" ic Blue
11 "M32" "triangle" ic Blue
12 "M34" "triangle" ic Blue
13 "M36" "triangle" ic Blue
14 "M37" "triangle" ic Blue
15 "M39" "triangle" ic Blue
16 "M40" "triangle" ic Blue
17 "M41" "triangle" ic Blue
18 "M45" "triangle" ic Blue
19 "M46" "triangle" ic Blue
20 "M47" "triangle" ic Blue
21 "M48" "triangle" ic Blue
22 "M50" "triangle" ic Blue
23 "M52" "triangle" ic Blue
24 "M54" "triangle" ic Blue
25 "M57" "triangle" ic Blue
26 "M65" "triangle" ic Blue
27 "M66" "triangle" ic Blue
28 "M67" "triangle" ic Blue
29 "M73" "triangle" ic Blue
30 "M75" "triangle" ic Blue
31 "M78" "triangle" ic Blue
32 "M82" "triangle" ic Blue
33 "M85" "triangle" ic Blue
34 "M87" "triangle" ic Blue
35 "M88" "triangle" ic Blue
36 "M89" "triangle" ic Blue
37 "M90" "triangle" ic Blue
38 "M94" "triangle" ic Blue
39 "M96" "triangle" ic Blue
40 "I2" "circle" ic Black
41 "I3" "circle" ic Black
42 "I5" "circle" ic Black
43 "I7" "circle" ic Black
44 "I8" "circle" ic Black
45 "I9" "circle" ic Black
46 "I15" "circle" ic Black
47 "I16" "circle" ic Black
48 "I17" "circle" ic Black
49 "I18" "circle" ic Black
50 "I19" "circle" ic Black
51 "I21" "circle" ic Black
52 "I22" "circle" ic Black
53 "I26" "circle" ic Black
54 "I27" "circle" ic Black
55 "I29" "circle" ic Black
56 "I30" "circle" ic Black
57 "I31" "circle" ic Black
58 "I34" "circle" ic Black
59 "I35" "circle" ic Black
60 "I36" "circle" ic Black
61 "I37" "circle" ic Black
62 "I38" "circle" ic Black
63 "I40" "circle" ic Black
64 "I41" "circle" ic Black
65 "I42" "circle" ic Black
66 "I43" "circle" ic Black
67 "I47" "circle" ic Black
68 "I48" "circle" ic Black
69 "I49" "circle" ic Black
*Matrix
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
```

```
*vertices 19 7
1 "M2" "circle" ic Blue
2 "M5" "circle" ic Blue
3 "M26""circle" ic Blue
4 "M61" "circle" ic Blue
5 "M63" "circle" ic Blue
6 "M64" "circle" ic Blue
7 "M80" "circle" ic Blue
8 "I3" "circle" ic Black
9 "I5" "circle" ic Black
10 "I17" "circle" ic Black
11 "I23" "circle" ic Black
12 "I27" "circle" ic Black
13 "I29" "circle" ic Black
14 "I30" "circle" ic Black
15 "I32" "circle" ic Black
16 "I36" "circle" ic Black
17 "I37" "circle" ic Black
18 "I38" "circle" ic Black
19 "I47" "circle" ic Black
*Matrix
1 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0
0 1 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 1 1 0 0
0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 1 1 1 0 0 0 1 1
0 0 1 0 1 0 0 1 0 0 0 0
```

```
*vertices 89 52
1 "G1" "diamond" ic Green
2 "G2" "diamond" ic Green
3 "G3" "diamond" ic Green
4 "G4" "diamond" ic Green
5 "G5" "diamond" ic Green
6 "G6" "diamond" ic Green
7 "G7" "diamond" ic Green
8 "G8" "diamond" ic Green
9 "G9" "diamond" ic Green
10 "G10" "diamond" ic Green
11 "G11" "diamond" ic Green
12 "G12" "diamond" ic Green
13 "G13" "diamond" ic Green
14 "G15" "diamond" ic Green
15 "G16" "diamond" ic Green
16 "G17" "diamond" ic Green
17 "G18" "diamond" ic Green
18 "G19" "diamond" ic Green
19 "G20" "diamond" ic Green
20 "G21" "diamond" ic Green
21 "G22" "diamond" ic Green
22 "G23" "diamond" ic Green
23 "G24" "diamond" ic Green
24 "G25" "diamond" ic Green
25 "G26" "diamond" ic Green
26 "G27" "diamond" ic Green
27 "G28" "diamond" ic Green
28 "G29" "diamond" ic Green
29 "G30" "diamond" ic Green
30 "G31" "diamond" ic Green
31 "G32" "diamond" ic Green
32 "G33" "diamond" ic Green
33 "G34" "diamond" ic Green
34 "G35" "diamond" ic Green
35 "G36" "diamond" ic Green
36 "G37" "diamond" ic Green
37 "G38" "diamond" ic Green
38 "G39" "diamond" ic Green
39 "G40" "diamond" ic Green
40 "G41" "diamond" ic Green
41 "G42" "diamond" ic Green
42 "G43" "diamond" ic Green
43 "G44" "diamond" ic Green
44 "G45" "diamond" ic Green
45 "G46" "diamond" ic Green
46 "G47" "diamond" ic Green
47 "G48" "diamond" ic Green
48 "G49" "diamond" ic Green
49 "G50" "diamond" ic Green
50 "G51" "diamond" ic Green
51 "G52" "diamond" ic Green
52 "G53" "diamond" ic Green
53 "I1" "circle" ic Black
54 "I2" "circle" ic Black
55 "I3" "circle" ic Black
56 "I4" "circle" ic Black
57 "I5" "circle" ic Black
58 "I6" "circle" ic Black
59 "I7" "circle" ic Black
60 "I8" "circle" ic Black
61 "I10" "circle" ic Black
62 "I11" "circle" ic Black
63 "I12" "circle" ic Black
64 "I14" "circle" ic Black
65 "I16" "circle" ic Black
66 "I17" "circle" ic Black
67 "I18" "circle" ic Black
68 "I19" "circle" ic Black
69 "I20" "circle" ic Black
70 "I21" "circle" ic Black
71 "I22" "circle" ic Black
72 "I24" "circle" ic Black
73 "I25" "circle" ic Black
74 "I26" "circle" ic Black
75 "I27" "circle" ic Black
```

76 "I28" "circle" ic Black
77 "I29" "circle" ic Black
78 "I30" "circle" ic Black
79 "I31" "circle" ic Black
80 "I34" "circle" ic Black
81 "I36" "circle" ic Black
82 "I37" "circle" ic Black
83 "I38" "circle" ic Black
84 "I40" "circle" ic Black
85 "I43" "circle" ic Black
86 "I45" "circle" ic Black
87 "I48" "circle" ic Black
88 "I49" "circle" ic Black
89 "I50" "circle" ic Black
*Matrix
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0
0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
1 1 1 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 1 0 0 1 1 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0
0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0
0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 1 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0 0 0
0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0

```
*vertices 59 27
1 "G3" "box" ic Green
2 "G6" "box" ic Green
3 "G7" "box" ic Green
4 "G9" "box" ic Green
5 "G11" "box" ic Green
6 "G12" "box" ic Green
7 "G13" "box" ic Green
8 "G15" "box" ic Green
9 "G20" "box" ic Green
10 "G21" "box" ic Green
11 "G22" "box" ic Green
12 "G23" "box" ic Green
13 "G25" "box" ic Green
14 "G27" "box" ic Green
15 "G28" "box" ic Green
16 "G30" "box" ic Green
17 "G31" "box" ic Green
18 "G32" "box" ic Green
19 "G35" "box" ic Green
20 "G41" "box" ic Green
21 "G43" "box" ic Green
22 "G44" "box" ic Green
23 "G45" "box" ic Green
24 "G46" "box" ic Green
25 "G48" "box" ic Green
26 "G49" "box" ic Green
27 "G53" "box" ic Green
28 "I1" "circle" ic Black
29 "I2" "circle" ic Black
30 "I3" "circle" ic Black
31 "I4" "circle" ic Black
32 "I5" "circle" ic Black
33 "I8" "circle" ic Black
34 "I10" "circle" ic Black
35 "I11" "circle" ic Black
36 "I12" "circle" ic Black
37 "I14" "circle" ic Black
38 "I16" "circle" ic Black
39 "I17" "circle" ic Black
40 "I18" "circle" ic Black
41 "I19" "circle" ic Black
42 "I21" "circle" ic Black
43 "I24" "circle" ic Black
44 "I25" "circle" ic Black
45 "I26" "circle" ic Black
46 "I27" "circle" ic Black
47 "I28" "circle" ic Black
48 "I29" "circle" ic Black
49 "I31" "circle" ic Black
50 "I34" "circle" ic Black
51 "I36" "circle" ic Black
52 "I37" "circle" ic Black
53 "I38" "circle" ic Black
54 "I40" "circle" ic Black
55 "I43" "circle" ic Black
56 "I45" "circle" ic Black
57 "I48" "circle" ic Black
58 "I49" "circle" ic Black
59 "I50" "circle" ic Black
*Matrix
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0
1 1 1 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 1 1 1 0 0 0 0
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0
0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0
```

0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 1 0 0 1
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 1 0 0 0

```
*vertices 41 21
1 "G1" "triangle" ic Green
2 "G2" "triangle" ic Green
3 "G4" "triangle" ic Green
4 "G5" "triangle" ic Green
5 "G8" "triangle" ic Green
6 "G10" "triangle" ic Green
7 "G17" "triangle" ic Green
8 "G19" "triangle" ic Green
9 "G24" "triangle" ic Green
10 "G26" "triangle" ic Green
11 "G29" "triangle" ic Green
12 "G33" "triangle" ic Green
13 "G34" "triangle" ic Green
14 "G36" "triangle" ic Green
15 "G37" "triangle" ic Green
16 "G38" "triangle" ic Green
17 "G39" "triangle" ic Green
18 "G40" "triangle" ic Green
19 "G50" "triangle" ic Green
20 "G51" "triangle" ic Green
21 "G52" "triangle" ic Green
22 "I3" "circle" ic Black
23 "I5" "circle" ic Black
24 "I6" "circle" ic Black
25 "I7" "circle" ic Black
26 "I8" "circle" ic Black
27 "I10" "circle" ic Black
28 "I14" "circle" ic Black
29 "I16" "circle" ic Black
30 "I17" "circle" ic Black
31 "I20" "circle" ic Black
32 "I22" "circle" ic Black
33 "I24" "circle" ic Black
34 "I30" "circle" ic Black
35 "I31" "circle" ic Black
36 "I36" "circle" ic Black
37 "I37" "circle" ic Black
38 "I38" "circle" ic Black
39 "I40" "circle" ic Black
40 "I45" "circle" ic Black
41 "I49" "circle" ic Black
*Matrix
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 1
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
```

```
*vertices 12 4
1 "G16" "circle" ic Green
2 "G18" "circle" ic Green
3 "G42" "circle" ic Green
4 "G47" "circle" ic Green
5 "I16" "circle" ic Black
6 "I17" "circle" ic Black
7 "I27" "circle" ic Black
8 "I29" "circle" ic Black
9 "I34" "circle" ic Black
10 "I36" "circle" ic Black
11 "I37" "circle" ic Black
12 "I48" "circle" ic Black
*Matrix
0 0 0 0 0 0 0 1
0 1 1 0 0 0 0 0
1 0 0 0 0 1 1 0
0 0 1 1 1 0 0 0
```

Appendix 17. List of sampled lizards at the five census, sorted according to islet, census, sex and ca

			Census 1 – Spring 2011			Censu
Lizard	**Islet**	**Sex**	**Capture date**	**Weight (g)**	**Length (cm)**	**Capture date**
G10	Na Guardis	Female	05/04/2011	5.6	6.2	
G4	Na Guardis	Female	06/04/2011	5.0	5.8	
G18	Na Guardis	Juvenile	07/04/2011	2.6	4.5	
G6	Na Guardis	Male	05/04/2011	8.4	6.6	15/06/2011
G11	Na Guardis	Male	06/04/2011	7.8	6.5	
G12	Na Guardis	Male	06/04/2011	5.6	6.2	
G13	Na Guardis	Male	06/04/2011	7.1	6.3	
G14	Na Guardis	Male	06/04/2011	4.9	5.6	
G15	Na Guardis	Male	06/04/2011	8.4	6.7	
G5	Na Guardis	Female				16/06/2011
G26	Na Guardis	Female				17/06/2011
G29	Na Guardis	Female				17/06/2011
G17	Na Guardis	Female				17/06/2011
G19	Na Guardis	Female				17/06/2011
G24	Na Guardis	Female				17/06/2011
G22	Na Guardis	Male				15/06/2011
G9	Na Guardis	Male				17/06/2011
G21	Na Guardis	Male				17/06/2011
G25	Na Guardis	Male				17/06/2011
G27	Na Guardis	Male				17/06/2011
G28	Na Guardis	Male				17/06/2011
G33	Na Guardis	Female				
G16	Na Guardis	Juvenile				
G30	Na Guardis	Male				
G31	Na Guardis	Male				
G1	Na Guardis	Female				
G2	Na Guardis	Female				
G34	Na Guardis	Female				
G36	Na Guardis	Female				
G37	Na Guardis	Female				
G38	Na Guardis	Female				
G39	Na Guardis	Female				
G40	Na Guardis	Female				
G8	Na Guardis	Female				
G42	Na Guardis	Juvenile				
G3	Na Guardis	Male				
G20	Na Guardis	Male				
G32	Na Guardis	Male				
G35	Na Guardis	Male				
G45	Na Guardis	Male				
G43	Na Guardis	Male				
G44	Na Guardis	Male				
G50	Na Guardis	Female				
G51	Na Guardis	Female				
G52	Na Guardis	Female				
G47	Na Guardis	Juvenile				
G7	Na Guardis	Male				
G46	Na Guardis	Male				
G48	Na Guardis	Male				

G23	Na Guardis	Male				
G41	Na Guardis	Male				
G49	Na Guardis	Male				
G53	Na Guardis	Male				
M3	Na Moltona	Female	13/04/2011	6.9	6.7	
M16	Na Moltona	Female	13/04/2011	7.5	6.9	
M85	Na Moltona	Female	13/04/2011	6.1	6.4	
M7	Na Moltona	Female	14/04/2011	6.7	6.2	
M8	Na Moltona	Female	14/04/2011	4.2	5.6	
M9	Na Moltona	Female	15/04/2011	5.2	5.9	
M73	Na Moltona	Female	15/04/2011	5.6	6.2	
M96	Na Moltona	Female	15/04/2011	7.4	6.8	
M34	Na Moltona	Female	xx-04-2011	7.1	6.6	
M2	Na Moltona	Juvenile	13/04/2011	7.8	6.8	
M5	Na Moltona	Juvenile	14/04/2011	3.8	5.4	
M15	Na Moltona	Male	13/04/2011	10.0	6.9	
M88	Na Moltona	Male	13/04/2011	7.3	6.5	
M6	Na Moltona	Male	14/04/2011	-	-	
M74	Na Moltona	Male	14/04/2011	10.7	7.2	
M81	Na Moltona	Male	14/04/2011	8.3	6.6	
M21	Na Moltona	Male	15/04/2011	8.4	6.8	
M83	Na Moltona	Male	15/04/2011	8.1	7.0	
M95	Na Moltona	Male	15/04/2011	8.9	6.9	
M4	Na Moltona	Female				07/06/2011
M14	Na Moltona	Female				08/06/2011
M17	Na Moltona	Female				08/06/2011
M10	Na Moltona	Male				07/06/2011
M11	Na Moltona	Male				07/06/2011
M13	Na Moltona	Male				08/06/2011
M1	Na Moltona	Female				
M23	Na Moltona	Female				
M36	Na Moltona	Female				
M70	Na Moltona	Female				
M75	Na Moltona	Female				
M87	Na Moltona	Female				
M89	Na Moltona	Female				
M90	Na Moltona	Female				
M94	Na Moltona	Female				
M76	Na Moltona	Male				
M29	Na Moltona	Male				
M43	Na Moltona	Male				
M69	Na Moltona	Male				
M71	Na Moltona	Male				
M77	Na Moltona	Male				
M79	Na Moltona	Male				
M84	Na Moltona	Male				
M91	Na Moltona	Male				
M92	Na Moltona	Male				
M93	Na Moltona	Male				
M18	Na Moltona	Male				
M46	Na Moltona	Female				
M32	Na Moltona	Female				

M37	Na Moltona	Female
M40	Na Moltona	Female
M41	Na Moltona	Female
M45	Na Moltona	Female
M47	Na Moltona	Female
M52	Na Moltona	Female
M28	Na Moltona	Female
M54	Na Moltona	Female
M57	Na Moltona	Female
M59	Na Moltona	Female
M78	Na Moltona	Female
M26	Na Moltona	Juvenile
M61	Na Moltona	Juvenile
M38	Na Moltona	Male
M42	Na Moltona	Male
M44	Na Moltona	Male
M86	Na Moltona	Male
M24	Na Moltona	Male
M33	Na Moltona	Male
M49	Na Moltona	Male
M51	Na Moltona	Male
M53	Na Moltona	Male
M55	Na Moltona	Male
M20	Na Moltona	Male
M31	Na Moltona	Male
M60	Na Moltona	Male
M35	Na Moltona	Male
M58	Na Moltona	Male
M19	Na Moltona	Male
M22	Na Moltona	Male
M50	Na Moltona	Female
M65	Na Moltona	Female
M66	Na Moltona	Female
M39	Na Moltona	Female
M48	Na Moltona	Female
M67	Na Moltona	Female
M82	Na Moltona	Female
M63	Na Moltona	Juvenile
M64	Na Moltona	Juvenile
M80	Na Moltona	Juvenile
M12	Na Moltona	Male
M62	Na Moltona	Male
M25	Na Moltona	Male
M97	Na Moltona	Male
M27	Na Moltona	Male
M30	Na Moltona	Male
M56	Na Moltona	Male
M68	Na Moltona	Male
M72	Na Moltona	Male

apture date.

ıs 2 – Summer 2011		Census 3 – Autumn 2011			Censu
Weight (g)	**Length (cm)**	**Capture date**	**Weight (g)**	**Length (cm)**	**Capture date**
8.6	6.8				
4.4	5.8				
4.6	5.8				
4.0	5.7				
5.1	6.1				
5.4	6.2				
4.4	6.0				
6.4	6.1				
6.4	6.0				
8.6	6.6				
6.7	6.3				
7.7	6.4				
7.6	6.6				
		10/10/2011	4.5	5.6	
		10/10/2011	8.1	6.7	
		10/10/2011	5.0	5.8	
		10/10/2011	8.1	6.5	
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					12/10/2012
					12/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					11/10/2012
					12/10/2012
					13/10/2012

4.8	6.2				
6.5	6.5				
2.9	5.1				
4.8	5.7				
7.4	6.8				
9.9	7.4				
		10/10/2011	5.3	6.2	
		10/10/2011	6.7	6.5	
		10/10/2011	8.7	6.8	
		10/10/2011	-	-	
		10/10/2011	-	-	
		10/10/2011	-	-	
		10/10/2011	-	-	
		10/10/2011	-	-	
		10/10/2011	-	-	
		07/10/2011	5.2	6.5	
		10/10/2011	10.8	7.0	
		10/10/2011	-	-	
		10/10/2011	7.7	7.0	
		10/10/2011	10.9	7.3	
		10/10/2011	12.1	7.5	
		10/10/2011	10.5	7.3	
		10/10/2011	10.5	7.5	
		10/10/2011	-	-	
		10/10/2011	-	-	
		10/10/2011	-	-	
		11/10/2011	11.9	7.4	
					16/10/2012
					16/10/2012

16/10/2012
16/10/2012
16/10/2012
16/10/2012
16/10/2012
17/10/2012
18/10/2012
19/10/2012
19/10/2012
19/10/2012
22/10/2012
16/10/2012
19/10/2012
16/10/2012
16/10/2012
16/10/2012
16/10/2012
17/10/2012
17/10/2012
17/10/2012
17/10/2012
17/10/2012
17/10/2012
18/10/2012
18/10/2012
19/10/2012
19/10/2012
19/10/2012
22/10/2012
22/10/2012

ıs 4 – Autumn 2012		Census 5 – Spring 2013		
Weight (g)	**Length (cm)**	**Capture date**	**Weight (g)**	**Length (cm)**
-	-			
-	-			
4.3	6.1			
4.3	5.7			
3.5	5.4			
6.0	6.3			
5.0	5.8			
4.5	5.9			
5.9	6.0			
6.9	6.3			
-	-			
7.2	6.5	09/04/2013	6.8	6.6
7.0	6.7			
7.3	6.4	10/04/2013	7.4	6.0
5.5	6.4	12/04/2013	7.2	6.4
6.4	6.4			
7.0	6.3			
		12/04/2013	4.0	5.9
		12/04/2013	4.0	4.5
		12/04/2013	6.4	6.3
		10/04/2013	3.9	5.0
		09/04/2013	7.2	6.7
		10/04/2013	5.5	5.9
		10/04/2013	6.8	6.0

		12/04/2013	8.5	6.7
		12/04/2013	8.0	6.7
		12/04/2013	8.6	6.6
		12/04/2013	8.6	6.7
		17/04/2013	10.0	7.4
4.0	5.7	16/04/2013	4.5	5.8
7.3	6.7			

5.3	5.8			
5.9	6.4			
5.2	6.0			
4.6	5.8			
4.5	6.2			
7.0	6.7			
6.3	6.1			
5.6	6.0			
4.3	5.6			
3.8	5.5			
7.2	6.9			
4.8	6.3			
3.5	5.4			
7.0	6.5			
10.0	7.3			
12.8	7.7			
9.8	7.0			
9.5	7.2			
7.5	6.7			
9.2	7.1			
5.1	5.7			
6.2	6.3			
13.0	7.8			
7.8	6.9			
7.2	6.5			
8.3	6.7			
9.0	6.9	16/04/2013	9.0	6.9
7.6	6.6			
9.3	7.2			
9.2	7.0			
		16/04/2013	5.0	6.2
		16/04/2013	6.4	6.6
		16/04/2013	6.1	6.4
		17/04/2013	7.6	6.6
		17/04/2013	5.6	5.7
		17/04/2013	5.4	5.8
		17/04/2013	6.2	6.5
		16/04/2013	2.4	4.6
		16/04/2013	5.9	6.3
		17/04/2013	9.3	7.3
		15/04/2013	11.2	7.5
		15/04/2013	6.5	6.3
		16/04/2013	8.4	6.8
		16/04/2013	-	-
		17/04/2013	10.4	7.3
		17/04/2013	9.2	7.0
		17/04/2013	8.2	6.6
		17/04/2013	10.0	7.0
		17/04/2013	16.0	7.8

Appendix 18. Invertebrate food items in the diet of *Podarcis lilfordi*.

Phylum	Class	Order	Family	Species	Common name (family level)
Arthropoda	Arachnida	Araneae	Clubionidae	Araneae sp. 1	Sac spider
				Araneae sp. 2	Sac spider
		Pseudo-scorpionida	Cheliferidae	Pseudoscorpionida sp.	House pseudoscorpion
	Diplopoda	Julida	Julidae	*Julus* sp.	Millipede
		Polydesmida	Polydesmidae	*Polydesmus* sp.	Armored millipede
	Insecta	Coleoptera	Carabidae	Carabidae sp.	Ground beetle
			Apionidae	*Apion* sp.	Weevil
			Byrrhidae	Byrrhidae sp.	Pill bettle
			Dasytidae	*Psilothrix* sp.	Soft-wing flower beetle
			Dermestidae	*Anthrenus* sp.	Skin beetle
			Chrysomelidae	Chrysomelidae sp.	Leaf beetle
				Aphthona sp.	Leaf beetle
				Bruchidius sp.	Leaf beetle
				Bruchus sp.	Leaf beetle
				Cryptocephalus sp.	Leaf beetle
			Curculionidae	Curculionidae sp. 1	Weevil
				Curculionidae sp. 2	Weevil
				Curculionidae sp. 3	Weevil
				Curculionidae sp. 4	Weevil
				Curculionidae sp. 5	Weevil
			Staphylinidae	Staphylinidae sp. 1	Rove beetle
				Staphylinidae sp. 2	Rove beetle
				Staphylinidae sp. 3	Rove beetle
				Staphylinidae sp. 4	Rove beetle
		Dermaptera	Labiidae	*Labia* sp.	Small earwig
		Diptera	Phoridae	*Megaselia* sp.	Humpbacked fly
			Pipunculidae	Pipunculidae sp.	Big-headed fly
			Tethinidae	*Tethina* sp.	Beach fly
			Scatopsidae	Scatopsidae sp.	Minute black scavenger fly
		Hemiptera	Cixiidae	*Cixius* sp.	Planthopper
			Lygaeidae	*Nysius* sp.	True bug
		Hymenoptera	-	Hymenoptera sp. 1	Saw fly, wasp, bee or ant
				Hymenoptera sp. 2	Saw fly, wasp, bee or ant
			Apidae	*Lasioglossum* sp.	Bee
			Formicidae	*Crematogaster scutellaris*	Ant
				Messor sp.	Ant
				Pheidole sp.	Ant
				Tetramorium sp.	Ant

			Halicidae	Halicidae sp.	Bee
		Lepidoptera	Tineidae or Geometridae	Tineidae sp. 1 or Geometridae sp. 1	Larva of fungus moth or geometer moth
				Tineidae sp. 2 or Geometridae sp. 2	Pupa of fungus moth or geometer moth
		Orthoptera	Phaneroteridae	*Phaneroptera nana*	Juvenile katydid
Mollusca	Gastropoda	Pulmonata	Cochlicellidae	*Cochlicella acuta*	Snail
				Cochlicella conoidae	Snail
			Helicidae	*Eobania vermiculata*	Snail
				Theba pisana	Snail
			Subulinidae	*Rumia decollata*	Juvenile predator snail

Appendix 19. Lizard-food items interactions sorted in a nested way.

Na Moltona	Food items	96	121	112	120	106	122	129	105	95	107	114	126	104	113	123
		I5	I37	I27	I36	I18	I38	I48	I17	I3	I19	I30	I43	I16	I29	I40
8	M10		1		1	1				1						
61	M64			1			1					1			1	
12	M14								1					1		
21	M23		1													
32	M34		1						1				1			
44	M46	1		1			1				1					
49	M51	1	1		1						1					
57	M60	1	1													
63	M66			1			1									
64	M67				1							1				
70	M74		1							1						
78	M82					1						1			1	
3	M4					1								1		
5	M6		1	1									1			
6	M8								1		1			1		
11	M13			1	1				1							
13	M15												1			
20	M22	1	1			1										
31	M33				1				1		1					
33	M35	1		1					1							
47	M49	1				1										
54	M56	1		1												
58	M61		1		1				1							
59	M62			1											1	
65	M68						1					1	1			
75	M79		1													
76	M80			1					1							
82	M86	1	1													
85	M89				1			1								
87	M91				1		1									1
2	M2									1						
10	M12		1	1												
14	M16		1													
15	M17									1	1					
25	M27														1	
27	M29						1						1			
34	M36		1					1								
35	M37	1	1													
36	M38		1													
39	M41	1														
40	M42	1														
41	M43						1						1			
45	M47	1				1										
46	M48			1		1										
48	M50			1												
50	M52	1								1						
52	M54	1	1													
53	M55		1								1					

55	M57	1					1									
62	M65			1								1				
66	M69		1													1
67	M71															
72	M76		1			1										
74	M78				1	1										
77	M81			1												
81	M85															
86	M90															
89	M93							1								
90	M94							1								
91	M95							1						1		
93	M97			1			1									
1	M1						1									
4	M5		1													
7	M9															
9	M11									1						
16	M18															1
17	M19	1														
18	M20	1														
19	M21					1										
22	M24	1														
23	M25															1
24	M26	1														
26	M28				1											
28	M30														1	
29	M31	1														
30	M32	1														
37	M39															1
38	M40	1														
42	M44	1														
43	M45	1														
51	M53															
56	M58	1														
60	M63											1				
68	M72															
69	M73		1													
71	M75							1								
73	M77				1											
79	M83							1								
80	M84															
83	M87													1		
84	M88							1								
88	M92							1								
92	M96															
		25	22	15	11	10	10	9	8	6	6	6	6	5	5	5

124	108	115	128	94	110	111	98	101	109	116	118	119	127	130	97	99	100	102
I41	I21	I31	I47	I2	I23	I26	I8	I11	I22	I32	I34	I35	I45	I49	I7	I9	I10	I13
								1										
			1															
						1												
	1															1		
	1																	
														1				
			1									1						
						1									1			
					1						1							
			1															
				1														
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					1													
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1	1																	
					1													
1				1														
									1					1				
1																		
							1											
		1																
		1																
			1															
1																		
											1							
5	4	4	4	3	3	3	2	2	2	2	2	2	2	2	1	1	1	1

103	117	125	
I15	I33	I42	
			5
			5
1			4
		1	4
			4
			4
			4
	1		4
			4
			4
			4
			4
			3
			3
			3
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			1
			1
			1
			1
			1
			1
			1
			1
			1
			1
			1
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Appendix 20. All lizards–food item interaction matrix. Na Moltona.

			Food items														
		Module no.	1	3	4	4	5	6	6	6	6	6	6	6	7	7	7
Lizards		No. in SA inpu	115	96	106	101	123	120	105	107	104	111	97	103	95	110	118
odule	SA in	**Field label**	I31	I5	I18	I11	I40	I36	I17	I19	I16	I26	I7	I15	I3	I23	I34
1	7	M9	1														
1	36	M38	1														
1	40	M42	1	1													
1	51	M53	1														
3	17	M19		1													
3	18	M20		1													
3	22	M24		1													
3	24	M26		1													
3	29	M31		1													
3	30	M32		1													
3	33	M35		1					1								
3	35	M37		1													
3	38	M40		1													
3	39	M41		1								1					
3	42	M44		1													
3	43	M45		1													
3	52	M54		1													
3	55	M57		1													
3	56	M58		1													
4	47	M49		1	1	1											
4	8	M10			1	1		1							1		
4	3	M4			1						1						
4	19	M21			1												
4	20	M22		1	1												
4	45	M47		1	1												
4	46	M48			1												
4	72	M76			1												
4	74	M78			1			1									
5	16	M18					1										
5	23	M25					1										
5	37	M39					1										
5	66	M69					1										
5	87	M91					1	1									
6	12	M14							1		1	1		1			
6	6	M8							1	1	1						
6	31	M33						1	1	1							
6	64	M67						1				1	1				
6	11	M13						1	1								
6	49	M51		1				1		1							
6	58	M61						1	1								
6	26	M28						1									
6	83	M87									1						
6	73	M77						1									
7	70	M74													1	1	1
7	2	M2													1	1	
7	92	M96															1

7	77	M81														1
7	9	M11													1	
7	15	M17								1					1	
7	50	M52		1											1	
8	13	M15														
8	75	M79														
8	90	M94														
8	85	M89						1								
8	81	M85														
8	89	M93														
8	76	M80							1							
8	67	M71														
8	80	M84														
8	34	M36														
8	71	M75														
8	79	M83														
8	84	M88														
8	88	M92														
8	91	M95									1					
9	61	M64														
9	63	M66														
9	65	M68														
9	78	M82			1											
9	59	M62														
9	25	M27														
9	54	M56		1												
9	48	M50														
9	41	M43														
9	5	M6														
9	27	M29														
9	62	M65														
9	44	M46		1						1						
9	93	M97														
9	68	M72														
9	60	M63														
9	28	M30														
9	1	M1														
10	21	M23														
10	57	M60		1												
10	86	M90														
10	82	M86		1												
10	14	M16														
10	32	M34							1							
10	4	M5														
10	10	M12														
10	53	M55								1						
10	69	M73														

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129	124	94	98	100	116	112	122	113	114	128	126	119	127	102	121	108	109	130
I48	I41	I2	I8	I10	I32	I27	I38	I29	I30	I47	I43	I35	I45	I13	I37	I21	I22	I49
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I9	I33	I42

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Appendix 21. Modular structure of the lizard-food network on Na Guardis, sorted according to season.

Module 1 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 1
G23	Male	8.5	6.7	vegetation edge to sand	spring	Millipede - *Julus* sp.
G49	Male	8.6	6.6	vegetation	spring	Leaf beetle - *Aphthona* sp.
G53	Male	8.6	6.7	vegetation edge	spring	Weevil - Curculionidae sp. 3
G20	Male	7.2	6.5	vegetation	spring and autumn	Minute black scavenger fly - Scatopsidae sp.
G35	Male	7.3	6.4	vegetation	spring and autumn	Larvae of moth - Tineidae sp. or Geometridae sp. 1
G45	Male	5.5	6.4	vegetation	spring and autumn	Snail - *Eobania vermiculata*
						Seed 3 & unidentified seed 2

Module 2 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 2
G16	Juvenile	8.1	6.7	vegetation edge to sand	autumn	Rove beetle - Staphylinidae sp. 4
G31	Male	8.1	6.5	vegetation	autumn	Small earwig - *Labia* sp.
G40	Female	4.5	5.9	vegetation edge	autumn	Snail - *Cochlicella acuta*
G15	Male	8.4	6.7	vegetation edge	spring	Seed 1 - *Rubia peregrina*
G48	Male	6.8	6.0	vegetation	spring	

Module 3 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 3
G3	Male	-	-	-	autumn	House pseudoscorpion - Pseudoscorpionida sp.
G8	Female	5.9	6.0	vegetation edge	autumn	Weevil - *Apion* sp.
G36	Female	4.3	5.7	vegetation	autumn	Weevil - Curculionidae sp. 1
G42	Juvenile	6.9	6.3	vegetation	autumn	Ant - *Messor* sp.
G43	Male	6.4	6.4	vegetation edge	autumn	Ant - *Pheidole* sp.
G10	Female	5.6	6.2	vegetation	spring	
G46	Male	5.5	5.9	vegetation	spring	
G50	Female	4.0	5.9	vegetation	spring	
G19	Female	5.4	6.2	vegetation edge to sand	summer	
G21	Male	8.6	6.6	vegetation	summer	
G22	Male	6.4	6.1	vegetation edge to sand	summer	
G27	Male	7.7	6.4	vegetation	summer	
G28	Male	7.6	6.6	vegetation edge	summer	

G29	Female	4.0	5.7	vegetation edge	summer	

Module 4 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 4
G4	Female	5.0	5.8	vegetation edge to sand	spring	Sac spider - Araneae sp. 1
G6	Male	8.4	6.6	vegetation edge to sand	spring and summer	Sac spider - Araneae sp. 2
G5	Female	4.4	5.8	vegetation	summer	Ground beetle - Carabidae sp. Skin beetle - *Anthrenus* sp. Leaf beetle - *Bruchus* sp. Weevil - Curculionidae sp. 4

Module 5 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 5
G30	Male	5.0	5.8	vegetation	autumn	Pill beetle - Byrrhidae sp.
G33	Female	4.5	5.6	vegetation	autumn	Weevil - Curculionidae sp. 2
G11	Male	7.8	6.5	vegetation	spring	Weevil - Curculionidae sp. 5
G12	Male	5.6	6.2	vegetation	spring	Beach fly - *Tethina* sp.
G41	Male	8.0	6.7	vegetation	spring	True bug - *Nysius* sp.
G51	Female	4.0	4.5	vegetation	spring	Ant - *Tetramorium* sp.
G9	Male	6.4	6.0	vegetation	summer	Seed 2 - unidentified seed 1
G17	Female	5.1	6.1	vegetation edge to sand	summer	
G24	Female	4.4	6.0	vegetation edge	summer	
G25	Male	6.7	6.3	vegetation	summer	
G26	Female	4.6	5.8	vegetation	summer	

Module 6 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 6
G32	Male	7.0	6.7	vegetation	autumn	Leaf beetle - Chrysomelidae sp.
G7	Male	6.2	6.2	vegetation	spring	Rove beetle - Staphylinidae sp. 1
G13	Male	7.1	6.3	vegetation edge	spring	Humpbacked fly - *Megaselia* sp.
G18	Juvenile	2.6	4.5	vegetation	spring	Big-headed fly - Pipunculidae sp.
G47	Juvenile	3.9	5.0	vegetation	spring	Bee - *Lasioglossum* sp.

Module 7 - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item - module 7
G1	Female	-	-	-	autumn	Armored millipede - *Polydesmus* sp.
G2	Female	-	-	-	autumn	Rove beetle - Staphylinidae sp. 2

G34	Female	4.3	6.1	vegetation	autumn	
G37	Female	3.5	5.4	vegetation	autumn	
G38	Female	6.0	6.3	vegetation	autumn	
G39	Female	5.0	5.8	vegetation	autumn	
G44	Male	7.0	6.3	vegetation edge to sand	autumn	

Outside network - Na Guardis

Individual	Sex	Weight (g)	Length (cm)	Site of capture	Season	Food item
G14	Male	4.9	5.6	vegetation	spring	none
G52	Female	6.4	6.3	vegetation	spring	Planthopper - *Cixius sp.*