**Text Box 1: Reconstructing past population extinctions**

In order to assess whether species became extinct as a result of long term island fragmentation, we apply here the idea of reconstruction of past island extinctions, (hereafter termed “local extinctions”), initially developed by Foufopoulos and Ives (1999). This concept states that the current distribution of species on present day islands which were previously connected in a single paleo-island, can be used to reconstruct the original species pool that was present on that paleo-island (e.g. Ali et al. 2014). We identified the moment in time (ky BP) that island fragments became isolated due to the drowning of the land bridges, we termed this the “Timing of isolation (Tiso)” in ky BP (Fig. 1b). Also we assess for each present-day island and paleo-island how long it did retain its island status before the present (for existing islands) or before eventually fragmenting further (for paleo-islands). This measure of time over which observed extinctions occurred is termed “Duration of isolation (ΔTiso)” in ky (Fig. 1b). Using both variables Tiso and ΔTiso we manually constructed a chronology of island fragmentation over time, producing an island fragmentation cladogram, whereby Tiso represents the nodes and ΔTiso represents the length of each branch in an island tree (Fig. 1b). This approach is based on the understanding that for reptiles in the Mediterranean, occurrence of species is determined predominantly by historic processes, including history of fragmentation and duration of isolation (ΔTiso), rather than present-day factors like overwater colonization or human activities (Foufopoulos, Kilpatrick and Ives 1999). Several lines of evidence support this, including absence of genetic evidence for overwater dispersal (e.g. Hurston et al. 2009, Santonastaso et al. 2017) and the presence of subfossils of taxa on islands where they are now extinct (reviewed in Foufopoulos et al. (2011)). Moreover, prior studies have shown that there is no statistically significant effect of distance from the nearest neighboring landmass to an island’s species richness (Foufopoulos and Ives 1999), as would be expected if overwater dispersal would have occurred. Indeed, because probability of successful recolonization declines with distance, the signature of overwater dispersal would be declining species numbers with increasing spatial isolation (Macarthur and Wilson 1967). In addition, we exclude from our analysis three taxa where introduction by humans may have occurred (*Chalcides occelatus, Hemidactylus turcicus,* and *Laudakia stellio),* as well as couple of terrapin taxa known to be strong swimmers (*Mauremys caspica* and *Emys orbicularis)* (Kornilios et al. 2010; Carranza and Arnold 2006, Karameta et al. 2022). We assume that climatic and environmental conditions were similar enough across a given paleo-island that local species had sufficiently homogenous distributions to initially occur on a fragment before splitting off. This in turn means that any present-day absence of species on previously connected island fragments can be interpreted as a local extinction. The reconstruction of past extinctions happens at the individual species level, however, once this process has been repeated for the total herpetofauna of a region, a total number of extinctions that occurred across all taxa along a particular tree branch (i.e. a present day or paleo-island) can be calculated (Fig. 1b). Because these aggregate extinctions occurred under the same, known, conditions, they can be used as a metric to determine the relative importance of different environmental drivers in causing species disappearance.

***Table 1.*** *Univariate OLS regression results of each variable against local extinctions. Bold are significant associations with a relatively large effect size, R2 > 0.15; n.s. is not significant.*

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| **Group** | **Parameters** | **R2** | **P** |
| Paleo fragmentation | **Log(Area) (km2)**  **Time since isolation (ky)**  Absolute area loss (km2)  **Area loss percentage (%)**  Absolute area loss rate (km2)  Absolute area loss percentage (%) | **0.20**  **0.36**  -  **0.15**  0.02  - | **<<0.05**  **<<0.05**  n.s.  **<<0.05**  <0.05  n.s. |
| Topographic conditions of present-day and paleo-island conditions | Average topographic roughness  Proportion of north facing slopes  Proportion of south facing slopes | 0.03  -  - | <0.05  n.s  n.s |
| Bioclimatic conditions | **mean temperature warmest quarter (MTWQ)**  mean annual precipitation  original precipitation  modern human population levels | **0.22**  0.12  0.13  - | **<<0.05**  <<0.05  <<0.05  n.s. |
| Bioclimatic conditions controlled by Area and time since isolation | mean temperature warmest quarter (MTWQ)  **mean annual precipitation**  **original precipitation**  modern human population levels | **-**  **0.20**  **0.19**  **-** | n.s.  **<<0.05**  **<<0.05**  n.s. |

***Table 2.*** *Nested model series. ΔAIC = difference in AIC value from the final selected model. Akaike weight was calculated as (Turkheimer et al. 2003).*

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| **Model structure** | **Model No.** | **AIC** | **ΔAIC** | **Akaike weight** |
| Extinctions ~ Area + ΔTiso (**null model)** | 1 | 652.73 | 22.72 | 2.903e-6 |
| Extinctions ~ Area + ΔTiso + MTWQ | 2 | 642.50 | 12.49 | 0.000885 |
| Extinctions ~ Area + ΔTiso + OP | 3 | 643.05 | 13.04 | 0.000646 |
| Extinctions ~ Area + ΔTiso + AR | 4 | 647.53 | 17.52 | 3.969e-5 |
| Extinctions ~ Area + ΔTiso + AR + OP | 5 | 639.80 | 9.79 | 0.000618 |
| Extinctions ~ Area + ΔTiso + MTWQ + OP | 6 | 636.04 | 6.03 | 0.038028 |
| Extinctions ~ Area + ΔTiso + MTWQ + AR | 7 | 634.26 | 4.25 | 0.067918 |
| **Extinctions ~ Area + ΔTiso + MTWQ + AR + OP** | **8** | **630.01** | 0 | **0.891862** |

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| a. |
| b. |

***Figure 1. a.*** *Reconstructed Aegean and Ionian coastlines during seven major climatic periods considered in this study spanning the last 21,500 years (see also Fig. 3a). Figure legend lists in Years before present (y BP) the starting date for each period. Grey represents present-day landmasses and white represents areas that were open water even at the lowest sea-level stand (Last Glacial Maximum). Dotted lines represent the five study island clusters.*

***b.*** *A set of local extinctions reconstructed for the species Elaphe quatuorlineata* *(pictured), in the Sporades archipelago. The species is present on green islands and absent on gray islands. Red crosses on the branches of the island cladograms indicate a local extinction of the species on that island. Cladogram structure (i.e. tree topology) represent the historic sequence of fragmentation as provided by the paleo-coastline model, whereby the branch nodes indicate the timing of isolation (Tiso) and branch lengths are indicative for the duration of isolation (ΔTiso) (here not to scale). At A Aspronisi separated from Skiathos, whereas earlier at B Agros and Tsougria split from the combined Skiathos and Asponisi islands. Therefore Tiso at A is later than at B (when sea levels were lower) but the duration of island isolation (ΔTiso) is longer than the duration of island isolation at B.*

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| ***Figure 2****. Work flow diagram. Step 1) By incorporating detailed bathymetry and a geological uplift raster of Greece into a fine-scale paleo-coastline model, we produced 43 raster layers recreating the paleo-coastline configuration in time steps of 500 years over the last 18 ky. Step 2)* *By analyzing these 43 rasters we established the fragmentation history for 132 (paleo) islands (including 80 present-day islands and 52 pre-existing islands), while also quantifying island area (km²), the degree of area loss (km²), as well as loss rates (km² / 500 y). We then compiled the data in a data cube of the island predictors through time. Step 3a) In addition, from these 43 rasters we also derived the timing of each island's separation from it’s ancestral land mass. Based on these fragmentation timings we further determined the duration of post-fragmentation isolation for each of the 123 islands and ultimately reconstructed the 5 archipelago’s cladograms (see also Suppl. Data S1c.). Step 3b) We intersected the paleo-coastlines of these 123 islands with both topographic rasters and rasters containing bio-climatic predictors, to obtain various island-specific environmental predictors of population extinction. Step 4) Using the documented reptile species communities of 83 present-day islands, in conjunction with the topology of each island cluster cladogram, and under assumptions of vicariance we recreated the species communities of past (intermediate) islands, and then inferred the number of island extinctions that had to happen on each of the ‘daughter’ islands to account for present-day impoverished species communities (see Box 1). Step 5) Using these local extinctions as dependent variable we used both univariate and multivariate statistics to analyze whether the predictors of step 3b were associated with local extinctions.* |

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| ***Figure 3. a.*** *Island fragmentation cladogram; example displays the separation sequence of one of the study clusters (the Sporades archipelago) over the 7 climatic periods considered in this study. Lower panel presents global average sea level changes occurring over the same period (Fleming et al. 1998).* ***b.*** *Map of Aegean island reptile extinctions. Color denotes percentage of original (mainland) reptile communities that went extinct since the LGM. Only land bridge islands are color-coded - deep-water islands and mainland areas are in gray. Dotted lines denote the 5 study island clusters.* ***c.*** *Paleo-coastlines of the Sporades showing fragmentation sequence over three time intervals and all islands showing percentage of extinctions. Highest extinction percentages are recorded on islands that fragmented earliest i.e. Gioura, Kyra Panagia and Peristera, while small fragments that split off relatively late also yield high extinction percentages e.g. Arkos and Tsougria.* |

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| ***Figure 4. a.*** *Plot showing extinctions decrease with increasing (Log) island area.* ***b.*** *Plot showing number of extinctions increase over time, per 1000 years about 1 species becomes locally extinct.* ***c.*** *Extinctions increased on islands that were disproportionally hot during the summer months (MTWQ in Co\*10).* ***d.*** *Standardized* β *coefficients of all parameters in final model (8); Area = log of (paleo) island area, Time = Duration of isolation, MTWQ = mean temperature of the warmest quarter, OP = original precipitation, AR = average roughness.* |