

Eden Arthropod Azores Database

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Abstract

This study intended to contribute to the current international directives concerning biodiversity, aiming to document and safeguard biological resources of the globe. Our objective was to present the most widely distributed and diverse taxa recorded during the sampling phase of the EDEN project (2008-2014), specifically all arthropod fauna, at all strata, within eight representative habitats of five islands of the Azores archipelago (Santa Maria, São Miguel, Terceira, Flores and Pico)

Keywords: Occurrence, Arthropoda, Azores, São Miguel, Terceira, Flores, Santa Maria, Pico, Island, anthropogenic impact gradient, habitat types, Samplingevent

Project details

Project title: Species inventory of Arthropoda across anthropogenic impacted habitats in the Azores archipelago

Personnel: José Marcelino, Paulo Borges, Isabel Borges, Paulo Borges

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Study area descriptions/descriptor: We selected the islands based on the relative proportion of land used in agriculture and pristine areas (based on published data by Costa et al. 2014), taking in consideration all possible combinations, i.e., São Miguel (SMG), with a high proportion of land allocated to pastures (61%) and a low/medium proportion of scattered native habitats (19.1%); (ii) Terceira (TER), with high proportion of land of pastures (66.9%) and a medium/high proportion of localized native habitats (21.3%); (iii) Pico (PIC), with high proportion of pastureland (50.3%) and medium/high proportion of centrally localized high altitude native habitats (35.5%); (iv) Flores (FLO), with scarce agricultural development (17.7%) and a high proportion of localized native habitats (43%); and, (v) Santa Maria /SMR), with high proportion of agricultural land (56.7%), not presently used, and a low proportion of localized native habitats (17.3%).

The importance of incorporating ecological gradients, such as an anthropogenic impact gradient, in biodiversity and conservation projects, has been previously assessed. They constitute a valuable parameter to infer possible causes for the distribution of species across the landscape (Ulrich et al. 2009). We therefore selected habitats that represented a gradient of increasing anthropogenic impact and management intensity. Nine habitat types divided between herbaceous and arborescent habitats were selected to represent a comprehensive range of the flora and fauna communities. These habitats were previously statistically validated (see Marcelino et al 2013, 2014). The herbaceous habitat gradient (Table 1) ranged from pristine meadows (MED) to corn fields (COR). The arborescent habitat gradient (Table 1) ranged from natural pristine forests of *Laurus azorica* (NAT) to orchards of *Citrus* sp. (ORC). Pristine meadows were not present on Santa Maria, and semi natural pastures at low altitude (SNPL) were used as a surrogate for MED on this island.

Design description: In order to obtain the maximum information on arthropod biodiversity, all strata present at a given habitat type were sampled, i.e., micro epigeal fauna (Berlese-Tullgren trapping), soil fauna (Pitfall trapping), aerial vagility fauna (Vacuum aspirator) and canopy fauna (sweeping nets).

Two parallel transects with fifteen pitfall traps (PF) were placed in 150x150 m geo-referenced plots. PF consisted of plastic cylinder cups 78 mm deep and 42 mm diameter filled with ca. 80 ml of a mixture of 96% alcohol and 0.05% liquid detergent. PF were buried in the soil so that the lip was flush with the surface and covered with a plastic plate at ca. 3

cm high, to avoid desiccation, flooding or insectivore predation. Traps remained in the soil for 7 days prior to collection. For each habitat type, and island, two replicate sites were monitored (with a minimum distance of 5 km apart), for a total of 80 sampling sites (i.e., 2 sites x 8 habitat types per island x 5 islands) each with one transects of 15 PF.

Suction (SU) and sweeping (SW) sampling followed the parallel transects previously referred for the pitfall traps (PF) and were performed concomitantly with the latter.

SU and SW were done to record species at strata other than the epigeic stratum. SU was made with a handheld aspirator (Stihl BG55), collecting the arthropods in shrubs, when available. SU was made individually for ca. 8 seconds, at each of 4 quadrant of the shrub or agro-culture plant. The specimens were transferred to a single cup. SW was made using a 1.5 m plastic stick to gently beat, twice, a primary branch at each quadrant of a given tree and using as a collecting device a 64 cm diameter sweeping net. The four samples per quadrant at a given sampling plant were then transferred to a single collecting cup.

Berlese-Tullgreen sampling (BT) was made by collecting ca. 100 grams soil litter per sampling unit (15 samples for each transect established at PF sampling, above described). Samples were then stored in a cooler to avoid proliferation of saprophytic fungi and sent to the Department of Biology, University of the Azores, Ponta Delgada. BT trap units consisted of two plastic darkened containers, assembled together to provide an upper vented area (14 cm diameter x 11.5 cm high) with 4 openings (1 cm diameter covered with a 0.3 x 0.3 mm diameter mesh), and coupled with a 15 W lamp on top. The lower collecting area (13 cm diameter x 10 cm high) and partially filled with ca. 80 ml of the same mixture used in PF. Litter samples were placed on a 1.8 x 1.8 mm mesh, attached to a plastic funnel positioned in the assembling zone between the two halves of the device. In order to avoid heat and dryness, Collembola crawl downward the litter sample and drop through the funnel into the collecting mixture. Litter samples remained for 72 h in BT before processing at laboratory facilities.

One island per week was sampled during the summer 2009 (July-August). This eliminated seasonal stochastic effects. The total number of samples was 4800 [80 sampling sites x 4 different types of traps x 15 samples per site]. The samples were processed in laboratory facilities and assigned to morphospecies groups, progressing to higher taxonomic degrees of identifications. Species richness and abundance were recorded. Species accumulation curves were performed for inventory completeness using EstimateS (Colwell, 2011). Inventory completeness was 70-75% for Staphylinidae and Collembola (Marcelino et al 2011, Marcelino et al 2016), reaching 80% for Araneae and Hymenoptera parasitoids (data not published).

Data published through GBIF:

http://ipt.gbif.pt/ipt/resource?r=eden_arthropod_database_azores

Taxonomic coverage

General taxonomic coverage description: Araneae, Collembola, Insecta

Taxonomic ranks

Class: Insecta

Order: Araneae, Collembola

Common names: Spiders, Springtails, Insects

Spatial coverage

General spatial coverage: Azores (Portugal). Islands of Santa Maria, São Miguel, Terceira, Pico and Flores

Coordinates: 36°54'21.6"N and 39°35'20.4"N Latitude; 31°18'39.6"W and 24°57'39.6"W Longitude

Temporal coverage: July 20, 2009 - August 23, 2009

Natural collections description

Collection name: EDEN -Database

Collection identifier: EDEN

Specimen preservation method: Alcohol

Methods

Method step description: See above details in Sampling description

Study extent description: We selected the islands based on the relative proportion of land used in agriculture and pristine areas (based on published data by Costa et al. 2014), taking in consideration all possible combinations, i.e., São Miguel (SMG), with a high proportion of land allocated to pastures (61%) and a low/medium proportion of scattered native habitats (19.1%); (ii) Terceira (TER), with high proportion of land of pastures (66.9%) and a medium/high proportion of localized native habitats (21.3%); (iii) Pico (PIC), with high proportion of pastureland (50.3%) and medium/high proportion of centrally localized high altitude native habitats (35.5%); (iv) Flores (FLO), with scarce agricultural development (17.7%) and a high proportion of localized native habitats (43%); and, (v) Santa Maria /SMR), with high proportion of agricultural land (56.7%), not presently used, and a low proportion of localized native habitats (17.3%).

Sampling description: In order to obtain the maximum information on arthropod biodiversity, all strata present at a given habitat type were sampled, i.e., micro epigeal fauna (Berlese-Tullgren trapping), soil fauna (Pitfall trapping), aerial vagility fauna (Vaccum aspirator) and canopy fauna (sweeping nets).

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Quality control description: Identifications were conducted in a progressive higher degree of taxonomy resolution, i.e., 1) morphospecies were generated and, concomitantly, an ongoing web-based image gallery stock was created (at www.eden-azores.webs.com). This secured consistency assigning specimens to morpho-species without duplications; 2) voucher specimens of morpho-species were sent to Dr. Paulo A. V. Borges to determine genus and species, when possible; 3) species of Collembola and Staphylinidae were genetically profiled to match genetic & morphological ID's; 4) All voucher specimens were sent to reference taxonomists in the respective Order, family, genus or group (taxonomists listed in the Personnel section of this report), which corroborated identifications from steps 1, 2 and 3.

Datasets

Dataset description

Object name: Darwin Core Archive Eden Arthropod Azores Database

Character encoding: UTF-8

Format name: Darwin Core Archive format

Format version: 1.0

Distribution: http://ipt.gbif.pt/ipt/archive.do?r=eden_arthropod_database_azores

Publication date of data: 2022-10-30

Language: English

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Metadata language: English

Date of metadata creation: 2020-11-12

Hierarchy level: Dataset