

Socioeconomics and temperature anomalies: drivers of introduced and native plant species composition and richness in the Canary Islands (1940-2010)



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Botanical Sciences
95 (1): 61-80, 2017

DOI: 10.17129/botsci.683

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Author Contributions

José Ramón Arévalo conceived, designed the experiments, analyzed the data and wrote the paper.

José Luis Martín conceived and designed the experiments, selected the data, prepared the data base and reviewed drafts of the paper.

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Abstract

Background: Islands are particularly sensitive to biological invasions. The arrival of humans with their cohort of accompanying species has been cited as one of the primary causes for ecosystem change.

Question: The introduction of these non-native species has been largely responsible for the tragic disappearance of native island biota and the dismantling of island ecosystems worldwide.

Methods: Ordination analyses to determined changes in native and exotic species composition along the period analysed.

Results: Mean temperature on the island of Tenerife has increased by around 0.6 °C in the last 70 years, while minimum temperature has risen by approx. 1.5 °C. Despite overall warming being milder than in the northern hemisphere, owing to the more sensitive biota these changes may have a strong influence on biodiversity. In addition, socioeconomic indicators have also changed significantly over the last 70 years with consequences for nature conservation. In this study, we analyse which parameters are best placed to explain the increase of introduced species, not just in terms of species richness, but also in species composition. We restrict the study to thermophile invasive and introduced species, as they respond more rapidly to climate change.

Conclusions: We found that socioeconomic aspects of development are important elements that relate closely to the increase in richness and changes in species composition for native as well for introduced species. In the case of invasive species richness, the average minimum temperature is the most closely related variable. However, mean temperature anomalies did not reveal any relationship with these changes.

Key words: Canary Islands, CCA, DCA, correlation, global warming, introduced species

Aspectos socioeconómicos y anomalías de temperatura: responsables del incremento del número de especies introducidas en las Islas Canarias (1940-2010)

Resumen

Antecedentes: Las islas son particularmente sensibles a las invasiones. La llegada de humanos con sus especies acompañantes son una de las primeras causas de cambios ecosistémicos.

Pregunta: ¿Se relacionan las especies introducidas con la desaparición de especies a lo largo de los ecosistemas insulares del planeta?

Métodos: Análisis de ordenación para determinar cambios de riqueza de especies nativas e introducidas a lo largo del periodo.

Resultados: La temperatura media de la isla de Tenerife se ha incrementado en 0.6 °C en los últimos 70 años, mientras que la media de las temperaturas mínimas en aproximadamente 1.5 °C. A pesar de que el calentamiento es inferior al sufrido en el hemisferio norte, la mayor sensibilidad de la especies a estos cambios puede provocar negativos efectos en la diversidad. Por otro lado, los indicadores socioeconómicos también han cambiado en los últimos 70 años con importantes cambios para el medio natural. En este trabajo analizamos que parámetros se relacionan mejor con el incremento de especies introducidas, no sólo en términos de riqueza, sino también de composición de especies. Restringimos el estudio a especies introducidas e invasoras termófilas.

Conclusiones: Hemos encontrado que los parámetros indicadores de desarrollo son importante elementos relacionados con el cambio en riqueza y composición de especies tanto naturales como introducidas. En el caso de la riqueza de invasoras, la media de la temperatura media aparece como variable relacionada. Aunque no hemos encontrado relaciones de temperaturas medias (sólo con la media de las mínimas) con las variaciones en especies introducidas e invasoras.

Palabras clave: calentamiento global, CCA, DCA, correlación, especies introducidas, Islas Canarias

Introduction

Invasive species have been considered one of the main causes of habitat degradation (Gurevitch & Padilla 2004) and highly related to global change and globalization (Kaluza *et al.* 2010). The result is an increase in the number of these species in different ecosystem around the planet, reaching areas that were almost inaccessible a few decades ago and even threatening protected plant communities (i.e. high altitudinal areas or riparian areas; Pauchard *et al.* 2009, Alexander *et al.* 2011, Aguiar & Ferreira 2013). Specific elements of globalization that explain the spread of invasive species around the planet are global change (global warming, nitrogen deposition or habitat fragmentation; Dukes & Mooney 1999) and also socioeconomic ones, such as gross domestic product (GDP; Sharma *et al.* 2010), transport (Westphal *et al.* 2008) or tourism (Sutherland 2000) among others. Ultimately, the economic (Pimentel *et al.* 2005), health (Levine & D'Antonio 2003), and ecological (Lockwood & McKinney 2001, Reaser *et al.* 2007) consequences can be substantial. For some areas, rapid economic development has accelerated biological invasions (Lin *et al.* 2007). Hulme (2009) argues that the best strategy for invasive species control is to regulate the mechanisms that govern globalization rather than direct species-by-species management. Globalization as a recent phenomenon has been one of the most substantial drivers behind the homogenization of insular biotas (Florencio *et al.* 2013) related to worldwide alien species expansion (Levine & d'Antonio 2003, Westphal *et al.* 2008, Pyšek *et al.* 2010).

Islands are particularly sensitive to biological invasions (Hulme 2004, Silva & Smith 2004). Humans' arrival with their accompanying species has been cited as the primary cause for ecosystems change (Atkinson & Cameron 1993). The tragic disappearance of native island biota and dismantling of island ecosystems worldwide have been primarily caused by the introduction of non-native species (Donlan & Wilcox 2008, Kueffer *et al.* 2010). In addition, mean temperature on the island of Tenerife has increased by around 0.6 degrees, while this increase has been almost 1.5 degrees in the case of minimum temperature (mean of nocturnal minima) in the last 70 years (Martín *et al.* 2012). The overall warming is milder than in the northern hemisphere, however, the more sensitive biota means that small changes can have a strong influence on community species composition.

As islands are considered more vulnerable to invasions, we analyse which parameters are best placed to explain the increase in introduced species, in terms of species richness and composition. We restricted the study to thermophile invasive and non-invasive introduced species, as they respond faster and are more closely related to climate change. We selected common socioeconomic parameters related to development, and also temperature anomalies detected in the archipelago. We analysed data going back to the 40s, as we have reliable information about these variables from this period onwards. The main hypotheses to test are whether mean and minimum temperature anomalies are the best variables to explain changes in species composition and richness of introduced and invasive species or whether other socioeconomic variables are more closely related to these changes. Based on the results we will suggest management proposals.

We consider that an interdisciplinary work involving economy, climate and ecology is required to understand the roles all these variables play in biological invasion and to provide a way forward in our understanding of the entire scenario of the process.

Material and methods

Study site. The Canary Island Archipelago is composed of seven islands, 100 km off Northwest Africa (28° N, 16° W). The islands exhibit a broad spectrum of habitats with marked altitudinal belts and islands of varied sizes. The highest island, Tenerife reaches 3,718 m a.s.l. and the lowest, Lanzarote, 800 m. Tenerife also occupies the largest (2,059 km²) and Hierro the smallest (273 km²) surface areas. The lower elevations exhibit a Mediterranean type climate, with cool, mild winters and warm, dry summers (< 300 mm of ppt/year). Mid-altitudes experience persistent cloud cover that maintains cool and humid summers, and colder winters with increased precipitation (>700 mm/year). Over 1,500 m a.s.l. the climate is more continental and arid, with

cold winters and very hot summers (< 500 mm ppt/year). Island altitude has substantial influence on local climate, but in general, the Canary Islands are considered temperate-subtropical.

The islands are a densely populated territory with more than 2 million residents, a busy tourist destination, and well connected to transport routes for trade in goods and services. Furthermore, the Canary Islands have been identified as a location subjected to the consequences of climate change (Sperling *et al.* 2004, del Arco 2008, Brito 2008, Martín *et al.* 2012). The region's biodiversity is characterized by its uniqueness with 3,857 endemic species among the 2,554 terrestrial plant taxa registered in the official biodiversity data bank of the Canarian Government (Arechavaleta-Hernández *et al.* 2010). However, 1,567 of these species have been introduced into the archipelago, reducing native flora endemism (in percentages with respect the total) from fifty percent of the biota a few centuries ago to one third of the species today.

The geographical position of Canary Islands is commercially influenced by Europe, Africa, and America, climatically by the temperate and tropical bands to the north and south, and ecologically by continental and oceanic systems to the east and west, respectively. This makes the islands particularly suitable for studying the influences of climate and global interconnectedness in island biological composition.

Biotic information. Following the criteria employed by the Canary Islands' biodiversity data-bank (Arechavaleta-Hernández *et al.* 2010), wild plant species (it does not include cultivate species, only does that dispersed without human assistance) were classified into the following three categories: native species, invasive and non-invasive introduced species. Native are endemic species of the archipelago and non-endemic but considered that reached the archipelago naturally (Arechavaleta-Hernández *et al.* 2010). From the last two groups, we selected only the thermophile species (defined as species whose original range of distribution is in warmer climates than the Canary Islands; Köppen & Geiger 1928), which tend to be the most sensitive species to climate change.

The method of assignment of the species to each decade has some limitations in as much as some of the plants could have arrived much earlier in the archipelago than the date they were detected in the field. Also, the species catalogue is base in published lists of species, and it is not taking into account the evolution of the species along the decades, they can be change from introduce to invasive (Dietz & Edwards 2006), but the period of time is short in order to consider important changes. In spite of that, the large amount of data allows the analysis and identification of relevant general patterns. We should consider this study as an exploratory analysis of relationships about this information and the variables used in the analyses, and that we consider is consistent with changes in the species composition.

Native taxa in the Canary Islands are defined as species that arrived via dispersal means not associated with anthropogenic activity (some of them have been able to evolve in situ and become endemic), such as species with restricted distribution, limited to one of the natural Canary Island habitats. If the accidental or deliberate introduction of a species into the Canary Islands is known, but the species has not extended its range throughout the islands to cause significant changes to ecosystems and native species, it is considered introduced non-invasive. Invasive species are characterized as being exotic species established in natural or semi-natural habitats, causing significant changes in ecological systems and native biota, with the potential for permanent disruption of the ecological continuity of the local environment. The total number of species included in the study were 41 invasive (hereafter invasive), 189 introduced non-invasive (hereafter introduced) and 477 native endemic (hereafter native).

All species were assigned to an appearance decade ranging from 1940 to 2010 (many of them were cited earlier, but these have been assigned to the 1940s' decade), on the basis of collection dates cited in bibliographical records. This method has the disadvantage of being subject to an unknown delay after the actual arrival and appearance date of the species, and subsequent report and publication date. Consequently, the number of species reported in our study for the last decade is likely to be less than the actual number of species present on the islands. Information on the presence of the species is accumulative, meaning that if the species is present in one year, it is assumed present in subsequent decades unless extinction or eradication has been documented.

Socioeconomic and climatic information. The majority of information has been extracted from

the Canarian Institute of Statistics (ISTAC; <http://www.gobiernodecanarias.org/istac>), and the information has been grouped in decades to prepare the information for comparison with the biotic information.

The variables selected were number of tourists (before 1960 the information was extracted from Anonymous 1997; hereafter TOU), gross domestic product (before 1950 the information was obtained from Díaz 2003; hereafter GDP) and population density (hereafter POP). We took the value of the variables at the end of the decade, so 1940 took variable values from December 1949.

For mean temperature anomalies (hereafter TEM) and minimum temperature anomalies (hereafter mTEM), we used the information provided by Martín *et al.* (2012), using the average temperature anomalies for each decade. We consider that the average of the decade is more indicative than the value of the last year of the decade, in order to avoid the natural variability of the climatic information.

Statistical analyses. Ordination techniques help to explain community variation (Gauch 1982), and they can be used to evaluate trends over time as well as in space (Franklin *et al.*, 1993, ter Braak & Šmilauer 1998). We used Detrended Correspondence Analysis (DCA; Hill & Gauch 1980, using CANOCO; ter Braak & Šmilauer 1998) to examine how species composition changed over time. Analyses were based on presence, and we analyzed the invasive, introduced and native species separately.

As a technique of direct gradient analysis, we used Canonical Correspondence Analysis (CCA; Hill & Gauch 1980) in CANOCO (ter Braak & Šmilauer 1998) to examine how species composition in different decades changed as a function of the independent matrix of information (TOU, GDP, POP, TEM and mTEM). We used a forward selection procedure to remove the variables that did not support a significant portion of the inertia reported by the analysis with a Monte Carlo permutation test (499 iterations for a $p < 0.05$) in CANOCO. Using this method we were able to estimate directly which variables were important to determine changes in species composition over these decades. Again, we proceeded by analyzing separately invasive, introduced and native species.

We correlated the site scores of the three DCA axis I and II with the five variables: TOU, GDP, POP, TEM and mTEM (using the Pearson correlation coefficient, for $p < 0.05$ and $n = 7$). Additionally, species richness of invasive, native and introduced was correlated with the indicated variables. For both analyses, we applied the Holm's procedure for multiple testing.

Basic statistical methods followed those of Legendre & Legendre (1998) and were implemented using the SPSS statistical package (SPSS 1997).

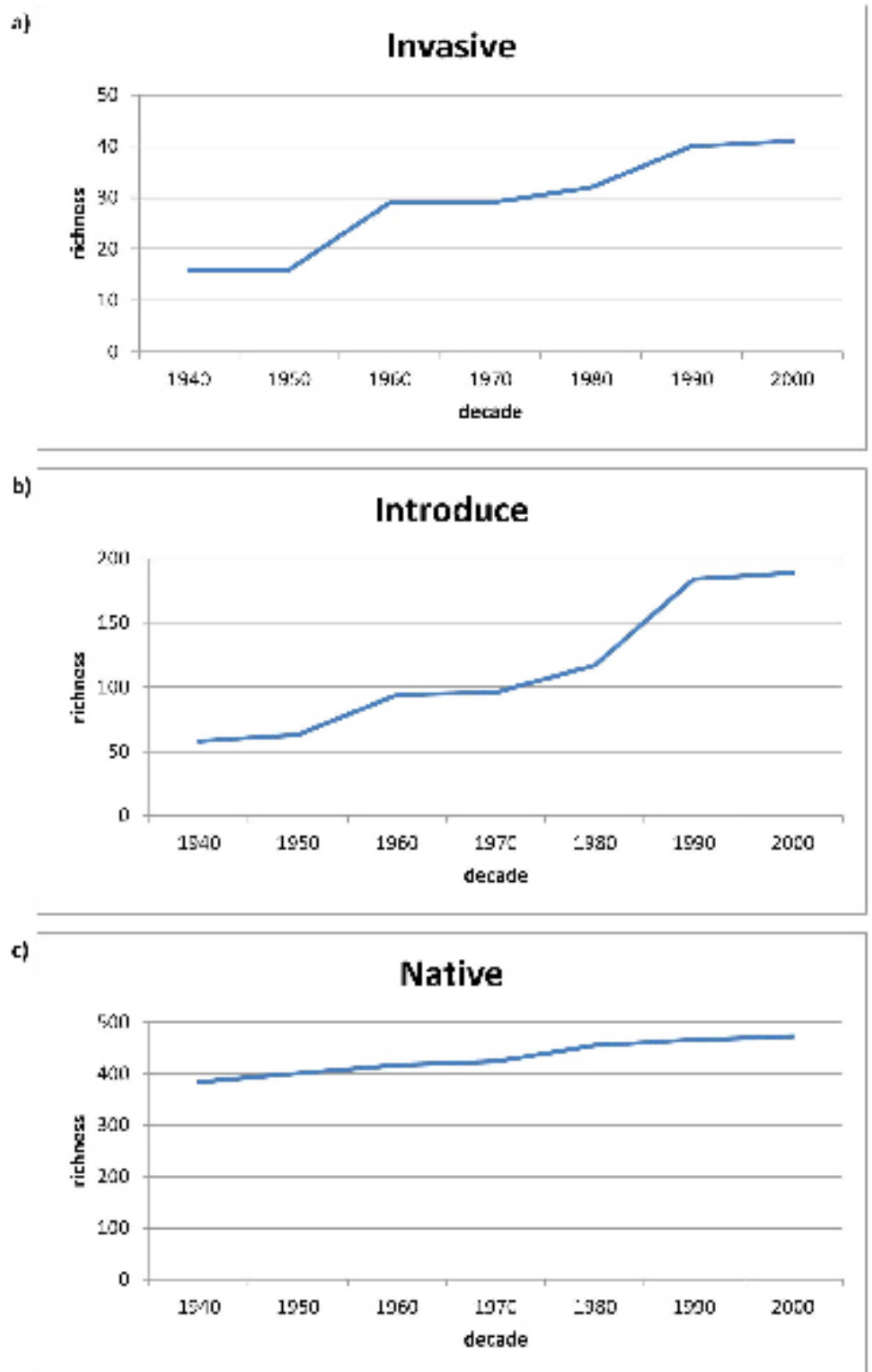
Results

Values for richness of invasive, introduced and native species have been increasing over the last decades. This increase has been faster in the case of introduced (356 %) species followed by invasive (256 %) and finally endemic native species (130 %). Regarding invasive species, the fastest increase in richness is found between 1950 and 1960; while for introduced ones the greatest rise was between 1980 and 1990. For native endemic, the rate of increase in richness appears more continuous (Figure 1); Tables 1, 2 and Appendix 1 provide a list of the species included in the three groups: invasive, introduced and native species.

The information for TOU, GDP, POP, TEM, mTEM is presented in Table 3. The dramatic increase in GDP is particularly important from the decades 1940 to 1960. This was the period in which the Spanish dictatorship began to open up the economy ending decades of autarchy. This was followed by the tourist boom that started in the 60s. While the main increase in tourist numbers appeared in the 80s, the largest population increase (25 %) was in the decade of the 90s. With regard to temperature anomalies, the greatest rise in temperature appears in the last decade, while a constant but almost insignificant increase was the common pattern in the previous decades. The change in average temperature is more relevant in the case of minimum temperatures.

The analysis of species composition for invasive species revealed that a few of the most aggressive ones were present during the first decade of this study such as *Opuntia maxima*, *Opun-*

Figure 1. Species richness over decades for **a)** invasive thermophile **b)** introduced thermophile and **c)** native.



tia dillenii, *Agave americana*, *Acacia farnesiana* or *Arundo donax*; whereas others arrived in the last few decades like *Crassula multicava* and *Chasmanthe aethiopica*. The greatest change in species composition occurred between 1950 and 1960 (Figure 2). In the case of introduced species, the DCA revealed a major change between 1950 and 1960, but also (base in DCA axis

Table 1. Pooled list of invasive thermophilic species for the decade in which were cited for the first time as indicated in Arechevalta-Hernández *et al.* (2010).

Invasive exotic species		Decade
<i>Acacia farnesiana</i>	(L.) Willd.	1940
<i>Agave americana</i>	L.	1940
<i>Ageratina adenophora</i>	(Spreng.) R. M. King & H. Rob.	1940
<i>Ageratina riparia</i>	(Regel) R. M. King & H. Rob.	1940
<i>Anredera cordifolia</i>	(Ten.) Steenis	1940
<i>Argemone mexicana</i>	L.	1940
<i>Arundo donax</i>	L.	1940
<i>Datura innoxia</i>	Mill.	1940
<i>Datura stramonium</i>	L.	1940
<i>Eleusine indica</i>	(L.) Gaertn.	1940
<i>Lantana camara</i>	L.	1940
<i>Melinis repens</i>	(Willd.) Zizka	1940
<i>Nicotiana glauca</i>	R. C. Graham	1940
<i>Nicotiana paniculata</i>	L.	1940
<i>Opuntia maxima</i>	Mill.	1940
<i>Tropaeolum majus</i>	L.	1940
<i>Acacia cyanophylla</i>	Lindl.	1960
<i>Cardiospermum grandiflorum</i>	Sw.	1960
<i>Cyrtomium falcatum</i>	(L.) C. Presl	1960
<i>Ipomoea cairica</i>	(L.) Sweet	1960
<i>Mirabilis jalapa</i>	L.	1960
<i>Nassella neesiana</i>	(Trin. & Rupr.) Barkworth	1960
<i>Neurada procumbens</i>	L.	1960
<i>Opuntia dillenii</i>	(Ker-Gawl.) Haw.	1960
<i>Opuntia robusta</i>	H.L. Wendland	1960
<i>Opuntia tomentosa</i>	Salm-Dyck	1960
<i>Opuntia vulgaris</i>	Mill.	1960
<i>Pennisetum setaceum</i>	(Forssk.) Chiov.	1960
<i>Tradescantia fluminensis</i>	Vell.	1960
<i>Acacia dealbata</i>	Link	1980
<i>Caesalpinia spinosa</i>	(Molina) Kuntze	1980
<i>Ipomoea indica</i>	(Burm. f.) Merr.	1980
<i>Austrocylindropuntia exaltata</i>	(Berg) Backeb.	1990
<i>Furcraea foetida</i>	(L.) Haw.	1990
<i>Hylocereus undatus</i>	(Haw.) Britton & Rose	1990
<i>Ipomoea purpurea</i>	(L.) Roth	1990
<i>Kikuyuochloa clandestinum</i>	(Vhiov.) H.Scholz	1990
<i>Leucaena leucocephala</i>	(Lam.) de Wit	1990
<i>Maireana brevifolia</i>	(R. Br.) P.G. Wilson	1990
<i>Wigandia caracasana</i>	Kunth	1990
<i>Atriplex semilunaris</i>	Aellen	2000

II) a change between 1990 and 2000. As for early arrivals, we found *Bidens pilosa* or *Solanum jasminoides*, and for late arrivals we have species like *Nicotiana glutinosa* or *Portulaca nica-raguensis* (Figure 3). Finally, for native species (Figure 4), only the decade coordinates are indicated (more than 500 species cannot be plotted), revealing a substantial change in species composition in the 1970s and 80s, possibly due to the foundation of the Faculty of Biology of the University of La Laguna (although this information has been not analyzed it agree with an increased with the number of publications that appeared in that decade).

When we correlated the decade coordinates of DCA- Axis I with the socioeconomic and temperature variables, the analysis revealed that native species are closely related to socioeconomic parameters over these decades. Additionally, with lower correlation strength, introduced species are also correlated with these variables and with mTEM; while invasive species revealed no

Table 2. Pooled list of introduce thermophilic species for the decade in which were cited for the first time as indicated in Arechevala-Hernández *et al.* (2010).

Introduce thermophilic species		Decade	Introduce thermophilic species		Decade
<i>Abutilon grandifolium</i>	(Willd.) Sweet	1940	<i>Senna bicapsularis</i>	(L.) Roxb.	1940
<i>Acacia farnesiana</i>	(L.) Willd.	1940	<i>Senna occidentalis</i>	(L.) Link	1940
<i>Achyranthes aspera</i>	L.	1940	<i>Sida acuta</i>	Burm. f.	1940
<i>Agave americana</i>	L.	1940	<i>Sida rhombifolia</i>	L.	1940
<i>Ageratina adenophora</i>	(Spreng.) R. M. King	1940	<i>Sigesbeckia orientalis</i>	L.	1940
	& H. Rob.		<i>Solanum pseudocapsicum</i>	L.	1940
<i>Ageratina riparia</i>	(Regel) R. M. King	1940	<i>Solanum robustum</i>	H.L. Wendl.	1940
	& H. Rob.		<i>Soliva stolonifera</i>	(Brot.) Sweet	1940
<i>Alternanthera caracasana</i>	"Humb., Bonpl. & Kunth"	1940	<i>Sorghum halepense</i>	(L.) Pers.	1940
<i>Amaranthus deflexus</i>	L.	1940	<i>Tagetes minuta</i>	L.	1940
<i>Amaranthus hybridus</i>	L.	1940	<i>Tropaeolum majus</i>	L.	1940
<i>Amaranthus lividus</i>	L.	1940	<i>Turbina corymbosa</i>	(L.) Raf.	1940
<i>Amaranthus muricatus</i>	(Moq.) Hieron.	1940	<i>Verbena bonariensis</i>	L.	1940
<i>Amaranthus viridis</i>	L.	1940	<i>Waltheria indica</i>	L.	1940
<i>Anredera cordifolia</i>	(Ten.) Steenis	1940	<i>Xanthium spinosum</i>	L.	1940
<i>Argemone mexicana</i>	L.	1940			
<i>Arundo donax</i>	L.	1940	<i>Casuarina equisetifolia</i>	L.	1950
<i>Asclepias curassavica</i>	L.	1940	<i>Cyperus involucratus</i>	Rottb.	1950
<i>Atriplex semibaccata</i>	R. Br.	1940	<i>Opuntia tuna</i>	(L.) Mill.	1950
<i>Bidens pilosa</i>	L.	1940	<i>Salvia leucantha</i>	Cav.	1950
<i>Caesalpinia sepiaria</i>	Roxb.	1940	<i>Solanum marginatum</i>	L. f.	1950
<i>Calceolaria tripartita</i>	Ruiz & Pav.	1940			
<i>Carthamus tinctorius</i>	L.	1940	<i>Acacia cyanophylla</i>	Lindl.	1960
<i>Ceratochloa cataractica</i>	(Vall) Herter	1940	<i>Adiantum raddianum</i>	C. Presl	1960
<i>Chamaesyce prostrata</i>	(Aiton) Small	1940	<i>Agave sisalana</i>	(Engelm.) Perr.	1960
<i>Chenopodium ambrosioides</i>	L.	1940	<i>Amaranthus quitensis</i>	"Humb., Bonpl. & Kunth"	1960
<i>Colocasia esculenta</i>	(L.) Schott	1940	<i>Bidens aurea</i>	(Dryand.) Sherff	1960
<i>Commelina benghalensis</i>	L.	1940	<i>Cardiospermum grandiflorum</i>	Sw.	1960
<i>Commelina diffusa</i>	Burm. f.	1940	<i>Chenopodium multifidum</i>	L.	1960
<i>Conyza bonariensis</i>	(L.) Cronquist	1940	<i>Ciclospermum leptophyllum</i>	(Pers.) Sprague	1960
<i>Conyza floribunda</i>	"Humb., Bonpl. & Kunth"	1940	<i>Cotula australis</i>	(Siebold ex Spreng.)	1960
<i>Conyza gouani</i>	(L.) Willd.	1940		Hook. f.	
<i>Cyperus rotundus</i>	L.	1940	<i>Cucurbita pepo</i>	L.	1960
<i>Datura innoxia</i>	Mill.	1940	<i>Cyrtomium falcatum</i>	(L.) C. Presl	1960
<i>Datura stramonium</i>	L.	1940	<i>Erigeron karvinskianus</i>	DC.	1960
<i>Einadia nutans</i>	(R. Br.) A. J. Scott	1940	<i>Eucalyptus camaldulensis</i>	Dehnh.	1960
<i>Eleusine indica</i>	(L.) Gaertn.	1940	<i>Galinsoga parviflora</i>	Cav.	1960
<i>Hunneimannia fumariifolia</i>	Sweet	1940	<i>Galinsoga quadriradiata</i>	Ruiz & Pav.	1960
<i>Lantana camara</i>	L.	1940	<i>Guizotia abyssinica</i>	(L. f.) Cass.	1960
<i>Lepidium bonariense</i>	L.	1940	<i>Ipomoea cairica</i>	(L.) Sweet	1960
<i>Lepidium sativum</i>	L.	1940	<i>Megathyrus maximum</i>	(Jacq.) B.K. Simon &	1960
<i>Lycopersicon esculentum</i>	Mill.	1940		S.W.L. Jacobs	
<i>Malvastrum coromandelianum</i>	(L.) Garcke	1940	<i>Melia azedarach</i>	L.	1960
<i>Melanthus comosus</i>	Vahl	1940	<i>Mirabilis jalapa</i>	L.	1960
<i>Melinis repens</i>	(Willd.) Zizka	1940	<i>Nassella neesiana</i>	(Trin. & Rupr.) Barkworth	1960
<i>Myrtus communis</i>	L.	1940	<i>Neurada procumbens</i>	L.	1960
<i>Nicandra physalodes</i>	(L.) Gaertn.	1940	<i>Oenothera jamesii</i>	Torrey & A. Gray	1960
<i>Nicotiana alata</i>	Link & Otto	1940	<i>Opuntia dillenii</i>	(Ker-Gawl.) Haw.	1960
<i>Nicotiana glauca</i>	R. C. Graham	1940	<i>Opuntia robusta</i>	H.L. Wendland	1960
<i>Nicotiana paniculata</i>	L.	1940	<i>Opuntia tomentosa</i>	Salm-Dyck	1960
<i>Nicotiana tabacum</i>	L.	1940	<i>Opuntia vulgaris</i>	Mill.	1960
<i>Oenothera rosea</i>	L'Hér. ex Aiton	1940	<i>Oryza sativa</i>	L.	1960
<i>Opuntia maxima</i>	Mill.	1940	<i>Oxalis corymbosa</i>	DC.	1960
<i>Paspalum paspalodes</i>	(Michx.) Scribn.	1940	<i>Oxalis latifolia</i>	Kunth	1960
<i>Pennisetum villosum</i>	R. Br. ex Fresen.	1940	<i>Pennisetum purpureum</i>	Schumach.	1960
<i>Phylla nodiflora</i>	(L.) E.L. Greene	1940	<i>Pennisetum setaceum</i>	(Forssk.) Chiov.	1960
<i>Physalis peruviana</i>	L.	1940	<i>Petunia parviflora</i>	Juss.	1960
<i>Ricinus communis</i>	L.	1940	<i>Phaseolus vulgaris</i>	L.	1960
<i>Salvia coccinea</i>	Juss. ex Murray	1940	<i>Salpichroa organifolia</i>	(Lam.) Baill.	1960
<i>Schinus molle</i>	L.	1940	<i>Sechium edule</i>	(Jacq.) Sw.	1960
<i>Scorpiurus muricatus</i>	L.	1940	<i>Sedum dendroideum</i>	(Moq. & Sessé) ex DC.	1960

Table 2. Continuation.

Introduce thermophilic species		Decade	Introduce thermophilic species		Decade
<i>Selaginella kraussiana</i>	(Kunze) A. Braun	1960	<i>Fuchsia coccinea</i>	Aiton	1990
<i>Solanum jasminoides</i>	Paxton	1960	<i>Furcraea foetida</i>	(L.) Haw.	1990
<i>Stenotaphrum secundatum</i>	(Walter) Kuntze	1960	<i>Gossypium herbaceum</i>	L.	1990
<i>Symphytotrichum squamatum</i>	(Spreng.) G.L. Nesom	1960	<i>Heliotropium curassavicum</i>	L.	1990
<i>Tagetes patula</i>	L.	1960	<i>Hylocereus undatus</i>	(Haw.) Britton & Rose	1990
<i>Tradescantia fluminensis</i>	Vell.	1960	<i>Hyparrhenia rufa</i>	(Nees) Stapf in Prain	1990
<i>Zebrina pendula</i>	Schnizl.	1960	<i>Impatiens olivieri</i>	C. H. Wright ex W. Watson	1990
<i>Ageratum houstonianum</i>	Mill.	1970	<i>Impatiens walleriana</i>	Hook. f.	1990
<i>Pennisetum thunbergii</i>	Kunth	1970	<i>Imperata cylindrica</i>	(L.) Rauschel	1990
<i>Acacia dealbata</i>	Link	1980	<i>Ipomoea batatas</i>	(L.) Lam.	1990
<i>Adiantum hispidulum</i>	Sw.	1980	<i>Ipomoea hederacea</i>	Jacq.	1990
<i>Azolla filiculoides</i>	Lam.	1980	<i>Ipomoea pes-caprae</i>	(L.) Sweet	1990
<i>Bougainvillea glabra</i>	Choisy	1980	<i>Ipomoea purpurea</i>	(L.) Roth	1990
<i>Bryophyllum delagoense</i>	(Eckl. & Zeyh.) Schinz	1980	<i>Kikyochoa clandestinum</i>	(Vhiov.) H.Scholz	1990
<i>Bryophyllum pinnatum</i>	(Lam.) Oken	1980	<i>Leucaena leucocephala</i>	(Lam.) de Wit	1990
<i>Caesalpinia spinosa</i>	(Molina) Kuntze	1980	<i>Lippia canescens</i>	"Humb., Bonpl. & Kunth"	1990
<i>Canna indica</i>	L.	1980	<i>Maireana brevifolia</i>	(R. Br.) P.G. Wilson	1990
<i>Casuarina cunninghamiana</i>	Miq.	1980	<i>Montanoa bipinnatifida</i>	(Kunth) C. Koch	1990
<i>Catharanthus roseus</i>	(L.) Don	1980	<i>Musa acuminata</i>	Colla	1990
<i>Commicarpus helenae</i>	(Schult.) Meikle	1980	<i>Nephrolepis exaltata</i>	(L.) Schott	1990
<i>Eleusine tristachya</i>	(Lam.) Lam.	1980	<i>Oenothera striata</i>	Ledeb. ex Link	1990
<i>Fuchsia boliviana</i>	Carrière	1980	<i>Oplismenus hirtellus</i>	(L.) P. Beauv.	1990
<i>Graptopetalum paraguayense</i>	(N. E. Br.) E. Walther	1980	<i>Parkinsonia aculeata</i>	L.	1990
<i>Hyparrhenia arrhenobasis</i>	(Hochst. ex Steud.) Stapf	1980	<i>Paspalum distichum</i>	L.	1990
<i>Ipomoea indica</i>	(Burm. f.) Merr.	1980	<i>Passiflora suberosa</i>	L.	1990
<i>Iris albicans</i>	Lange	1980	<i>Phaedranthus buccinatorius</i>	(DC.) Miers	1990
<i>Leonotis nepetifolia</i>	(L.) R. Br. in Aiton	1980	<i>Phyllanthus tenellus</i>	Roxb.	1990
<i>Maurandya scandens</i>	(Cav.) Pers.	1980	<i>Pistia stratiotes</i>	L.	1990
<i>Paspalum dilatatum</i>	Poir.	1980	<i>Pteris cretica</i>	L.	1990
<i>Paspalum urvillei</i>	Steud.	1980	<i>Pteris multifida</i>	Poir.	1990
<i>Pisum sativum</i>	L.	1980	<i>Pyrostegia venusta</i>	(Ker-Gawl.) Miers	1990
<i>Senna didymobotrya</i>	(Fresen.) H. S. Irwin & Barneby	1980	<i>Saccharum officinarum</i>	L.	1990
<i>Setcreasea pallida</i>	Rose	1980	<i>Salvinia natans</i>	(L.) All.	1990
<i>Agave ferox</i>	C. Koch	1990	<i>Sansevieria trifasciata</i>	Prain	1990
<i>Agave fourcroydes</i>	Lem.	1990	<i>Sedum mexicanum</i>	Britton	1990
<i>Alpinia zerumbet</i>	(Pers.) Burt & R. M. Sm.	1990	<i>Senna corymbosa</i>	(Lam.) H. S. Irwin & Barneby	1990
<i>Amaranthus caudatus</i>	L.	1990	<i>Senna multiglandulosa</i>	(Jacq.) H. S. Irwin & Barneby	1990
<i>Amaranthus cruentus</i>	L.	1990	<i>Sesuvium portulacastrum</i>	(L.) L.	1990
<i>Amaranthus standleyanus</i>	Parodi ex Covas	1990	<i>Sidastrum paniculatum</i>	(L.) Fryxell	1990
<i>Atriplex suberecta</i>	Verd.	1990	<i>Simmondsia chinensis</i>	(Link) C. K. Schneid.	1990
<i>Austrocylindropuntia cylindrica</i>	(Lam.) Backeb.	1990	<i>Solanum giganteum</i>	Jacq.	1990
<i>Austrocylindropuntia exaltata</i>	(Berg) Backeb.	1990	<i>Solanum gracile</i>	Otto	1990
<i>Bambusa vulgaris</i>	Schrad.	1990	<i>Solanum mauritianum</i>	Scop.	1990
<i>Brugmansia suaveolens</i>	(Willd.) Bercht. & J. Presl	1990	<i>Solanum microcarpum</i>	(Pers.) Vahl	1990
<i>Bryophyllum daigremontianum</i>	(Raym.-Hamet & Perr.)	1990	<i>Solanum nodiflorum</i>	Jacq.	1990
<i>Bryophyllum proliferum</i>	Bowie ex Curtis	1990	<i>Solanum tuberosum</i>	L.	1990
<i>Calliandra tweedii</i>	Benth.	1990	<i>Tithonia diversifolia</i>	(Hemsl.) A. Gray	1990
<i>Calotropis procera</i>	(Aiton) W. T. Aiton	1990	<i>Tradescantia blossfeldiana</i>	Mildbr.	1990
<i>Cicer arietinum</i>	L.	1990	<i>Tripleurospermum inodorum</i>	(L.) Sch. Bip.	1990
<i>Coffea arabica</i>	L.	1990	<i>Wigandia caracasana</i>	"Humb., Bonpl. & Kunth"	1990
<i>Conyza sumatrensis</i>	(Retz.) E. Walker	1990	<i>Xerochrysum bracteatum</i>	(Vent.) Tzvelec	1990
<i>Corchorus depressus</i>	(L.) Stocks	1990	<i>Zea mays</i>	L.	1990
<i>Cortaderia selloana</i>	(Schult. & Schult. f.) Asch. & Graebn.	1990	<i>Atriplex semilunaris</i>	Aellen	2000
<i>Cyperus esculentus</i>	L.	1990	<i>Gnaphalium antillanum</i>	Urb.	2000
<i>Desmanthus virgatus</i>	(L.) Willd.	1990	<i>Nicotiana glutinosa</i>	L.	2000
<i>Euphorbia milii</i>	Des Moul. ex Boiss.	1990	<i>Portulaca nicaraguensis</i>	(Danin & H. G. Baker) Danin	2000
			<i>Portulaca papillato-stellulata</i>	(Danin & H. G. Baker) Danin	2000
			<i>Suaeda fruticosa</i>	Forssk. ex J. F. Gmel.	2000

Figure 2. Species and decade scores in the space defined by axes I and II of DCA based on the presence of the invasive thermophile species following the Arechavaleta-Hernández *et. al* (2010) check list. Eigenvalues of axes I and II were 1.330 and 0.511, respectively, and the cumulative percentage of variance explained by both axes was 65.2 %. The names of the species use the first three letters of the genus and the first three letters of the specific epithet (Table 1 for species full names).

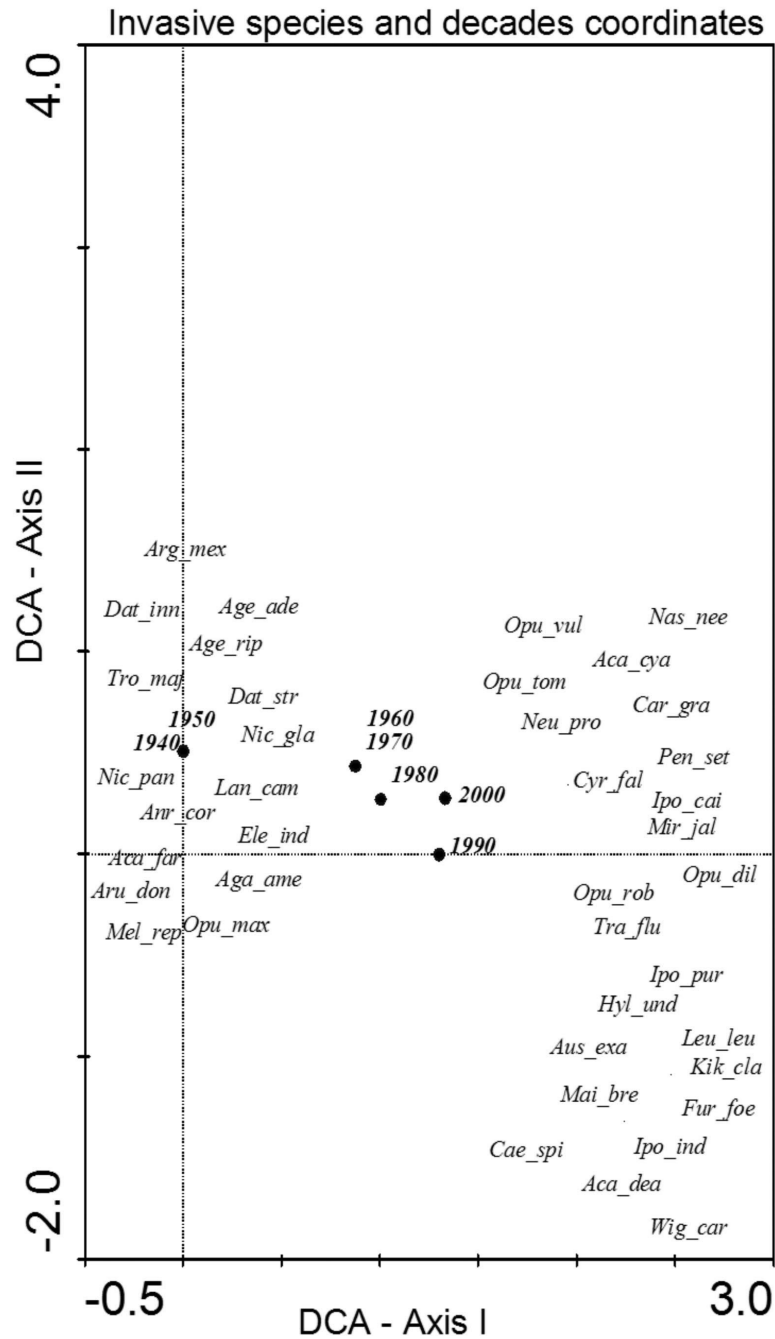


Table 3. Socioeconomic and climatic information (GDP: Gross domestic product in millions €; POP: Resident population; TOU: Millions of tourists; TEM: mean temperature anomalies; mTEM: minimum mean temperature anomalies).

Decade	GDP	POP	TOU	TEM	mTEM
1940	44	813290	15	-0.207	-0.473
1950	1.801	974989	73	-0.203	-0.495
1960	5.264	1137599	792	0.151	0.010
1970	10.191	1388243	2228	-0.155	-0.292
1980	19142	1621710	5459	0.044	0.090
1990	32059	1767867	9975	0.077	0.179
2000	42097	2219846	8611	0.344	0.463

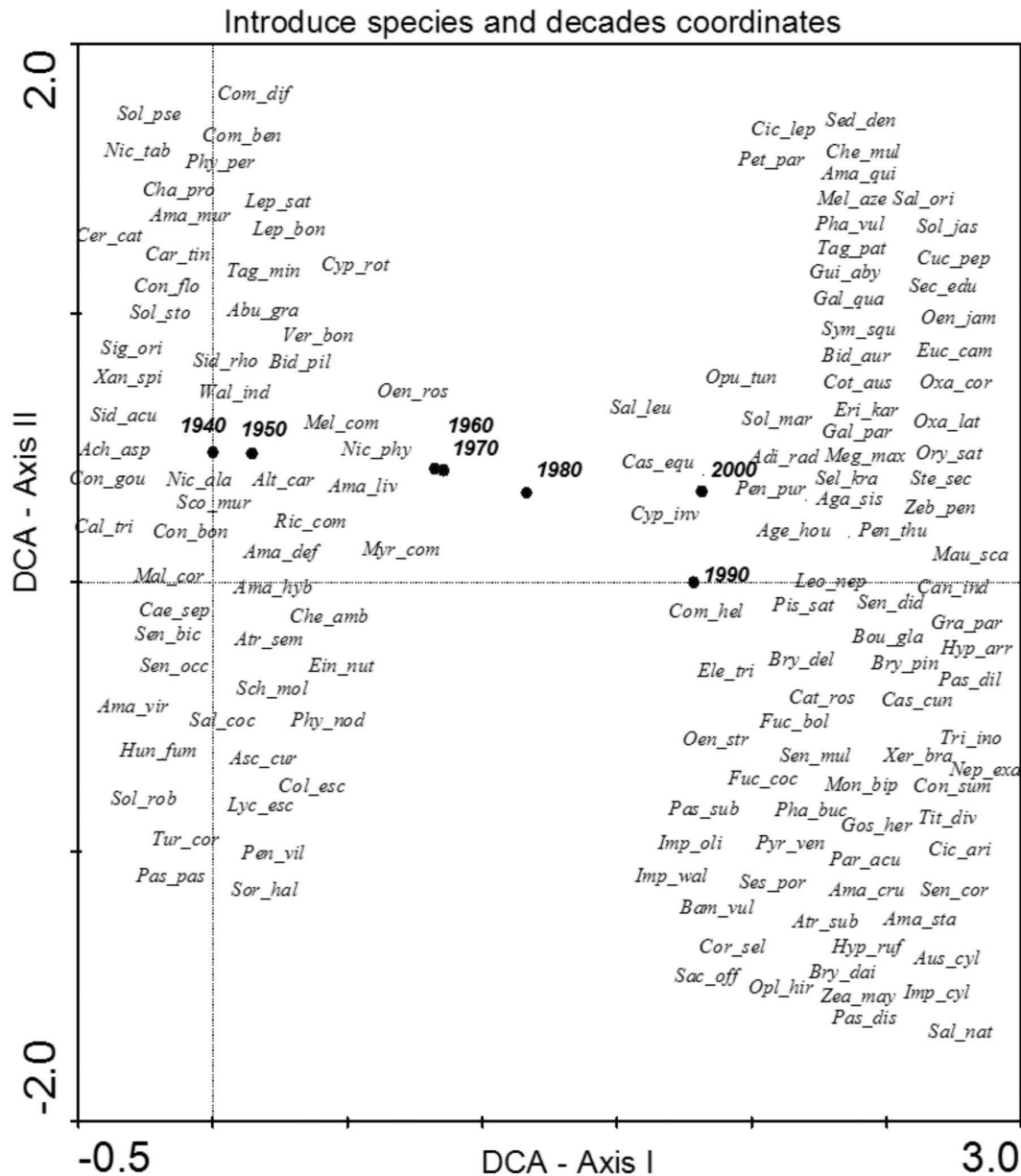


Figure 3. Species and decade scores in the space defined by axes I and II of DCA based on the presence of the introduced thermophile species following the Arechavaleta-Hernández *et. al* (2010) check list. Eigenvalues of axes I and II were 1.813 and 0.484, respectively, and the cumulative percentage of variance explained by both axes was 70.8 %. The names of the species use the first three letters of the genus and the first three letters of the specific epithet (Table 2 for species full names).

Table 4. Pearson correlation coefficients for decades coordinates on axes I and II of DCA and socioeconomic and temperature anomaly variables.

Variables	DCA - Axis I			DCA - Axis II		
	Invasive	Introduce	Native	Invasive	Introduce	Native
GDB	0.843	0.943**	0.970**	-0.793	-0.691	0.521
POP	0.887	0.948**	0.968**	-0.725	-0.604	0.529
TUR	0.839	0.942*	0.967**	-0.929	-0.856	0.267
TEM	0.809	0.819	0.779	-0.533	-0.413	0.589
mTEM	0.911	0.936**	0.918	-0.720	-0.598	0.478

After multiple test Holm's procedure (*) $p < 0.01$; (**) $p < 0.05$; $n = 7$.

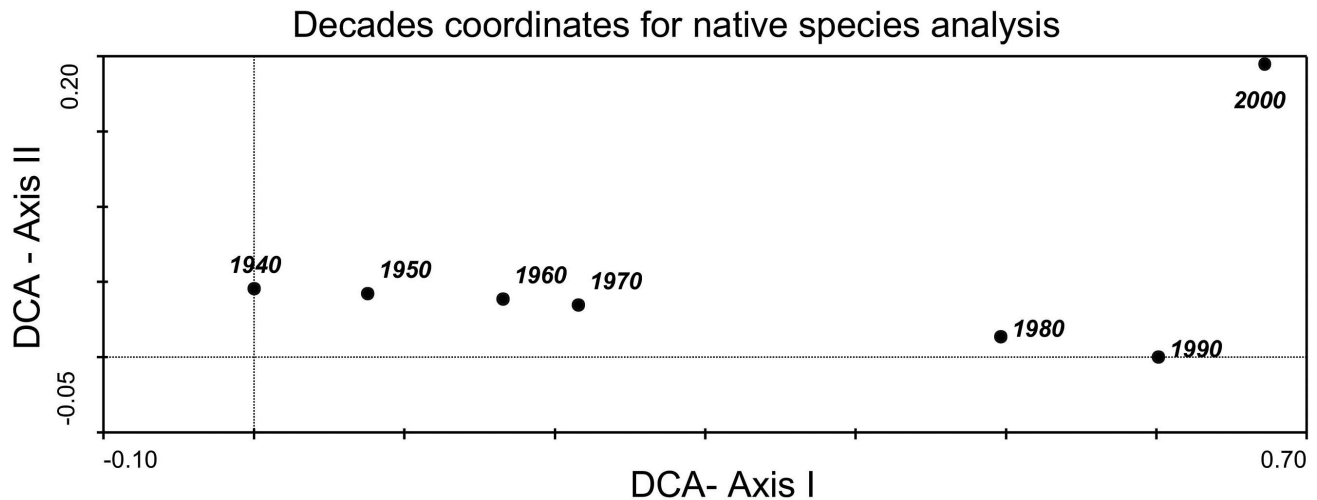


Figure 4. Decade scores in the space defined by axes I and II of DCA based on the presence of the native species following the Arechavala-Hernández *et al.* (2010) check list. Eigenvalues of axes I and II were 0.672 and 0.195, respectively, and the cumulative percentage of variance explained by both axes was 69.8 %.

Table 5. Pearson correlation coefficients for species richness over the decades and socioeconomic and temperature anomalies variables.

Variables	Invasive	Introduce	Native
GDB	0.913	0.979*	0.946**
POP	0.931	0.942**	0.966*
TOU	0.906	0.970*	0.945**
TEM	0.832	0.802	0.782
mTEM	0.938**	0.913	0.918

After multiple test Holm's procedure (*) $p < 0.01$; (**) $p < 0.05$; $n = 7$.

correlation with any of the parameters used in the analysis. The DCA-Axis II did not reveal any correlation among these variables with the decade coordinates (Table 4).

The direct gradient analysis (CCA) also showed similar patterns to the DCA. In the case of invasive species, the Montecarlo Test for the decade scores of CCA-Axis I with respect to the 4 explanatory variables (499 iterations) indicated that the only variable explaining species composition all along the axis is TOU ($F = 6.25$; $p < 0.001$), with the same result for the introduced ones ($F = 9.110$; $p < 0.01$), while for native, GDP was the only variable ($F = 9.01$, $p < 0.01$).

The correlation of species richness with the variables revealed a similar pattern for native and introduced species, where GDP, POP and TOU were significantly correlated with the increase in species richness, while for invasive, the correlated variable explaining the variability of species richness of this group was mTEM (Table 5).

Discussion

Species invasions are governed by factors such as environmental conditions and species traits as well as human activities (Pyšek *et al.* 2010). It is well known that socioeconomic variables are driving forces of invasion across national and international boundaries (population, international trade, globalization economy, transport...); while aspects related to global warming and climate change appear to have less effect in some studies (Le Maitre *et al.* 2004) and as our results in this study demonstrate. The degree of development is directly related to the number of invasive species and the impact can be immediately evident or lag for a period over 100 years (Weber & Li 2008).

In our study, we have found a faster rate of increase in the number of invasive and introduced species than in the number of native species during these decades (Figure 1). Based on absolute numbers, introduced species is the group that has been increasing the fastest over the last seven decades. It is also true that we have centered the study on thermophile invasive and introduced species, as they have been considered more adaptable and responsive to global warming (Sobrino *et al.* 2001). Global warming is considered to affect ecophysiological processes of plant systems resulting in advances of thermophilic species and expansion of their ranges (Hilbert *et al.* 2001, Sobrino *et al.* 2001). Increases in CO₂ and in temperature are determining factors related to the prevalence of invaders (Dukes & Mooney 1999).

In spite of the importance of global warming in favoring species to reach, up till now otherwise inhabitable areas (*i.e.* high altitudinal zones; Pauchard *et al.* 2009), we have found that socioeconomic aspects of development (GDP, POP and TOU) are important elements that better explain the increase in richness and changes in species composition. However, mTEM appears in these correlations as significant in the case of invasive species richness and in the case of DCA introduced species composition. The results are in some way similar to other studies, where economic variables similar to GDP (*i.e.* per capita real state) have been found as the most important variables to explain the distribution of non-native species (Taylor & Irwin 2004), as well as other indicators, such as the human development index (Weber & Li 2008) or population movements (Margolis *et al.* 2005). Population and tourism, in our case, have been revealed as the most consistent variables to explain species composition and species richness. In fact, these are the only variables that explain changes in invasive species composition and richness (Table 4) and are significant in other analyses, as demonstrated in other studies (Pyšek *et al.* 2010, Lockwood *et al.* 2005).

In our study, the increase in mTEM has only been significant in the case of invasive richness and introduced species composition. In other studies related to altitudinal gradients, minimum temperatures appear as a good predictor to displace the tree or other species line at higher altitudes (Dukes *et al.* 2009), including invasive ones, which have been revealed as another threat to well-protected altitudinal areas (Sheppard *et al.* 2014; Pauchard *et al.* 2009).

The number of tourist has not often been considered in studies about determinants that drive introduced species. In our case, it is very closely related to the number of introduced species, although it was also significant for the other groups of species richness as well as for explaining species composition. Tourism is the principal economic activity of the archipelago, with over 12 million visitors in 2012 (with an average stay of 10 days). We should consider the impact of tourism not just as a number, but also in terms of the numerous activities associated with tourism (excursions, spectacles, transport).

We expected that temperature anomalies (minimum) would play a more significant role in the changes in species composition and richness over the decades. In fact, we selected the thermophile species, expecting to favor the appearance of significant relationships. However, these relationships have been found to be very low, even when analyzing the data individually with species richness. In spite of these results, we still consider that temperature anomalies, as long as they follow IPCC predictions, will become an important driver of species invasion. Climatic changes predicted by the IPCC in the Mediterranean area are likely to determine significant changes in species forest composition. In fact, the moderate scenarios of the IPCC predict a severe decrease in precipitations and a rise of 3–4 °C in average temperatures (de Castro *et al.* 2004), with a similar scenario for Canary Islands based on the newest and most sensitive IPCC estimations (IPCC 2013). So far, changes detected over the past 70 years have not reached 2 °C. This could be the reason why this effect is not detectable yet, and also because of the great socioeconomic changes that affected the Canary Islands during these decades (tourism boom in the 60s, the arrival of democracy in 1974, joining the European Community 1984, etc.).

One of the results common to both native and introduced species is that they are affected by the same socioeconomic factors (although invasives were only significantly related to population), following the pattern that is known as “what it is good for native is also good for introduced species” (Stohlgren *et al.* 1999, Foster *et al.* 2002). In this case, despite the appearance of new of native or introduced species, we cannot relate this appearance to a

“biological invasion crisis” but to a deeper economic development of the Canary Islands’ society that invests more in research and discovery of species. In fact, in the last five decades in Canary Islands has been described an average of three new species of terrestrial flora each year (Martín *et al.* 2005). It is also true that this economic development favors propagule dispersion at a faster rate than the appearance of native species, as found in our data, and this should be an important concern for environmental managers (Figure 1). As globalization is a force that favors propagule pressure (Lockwood *et al.* 2005), its association with the increase in the number of introduced species comes as no surprise. Something similar happens with the observed relationship between the invaders and mTEM; the less important the temperature is as a limiting factor, the greater the chances of survival, allowing better growth of alien species in the range introduced. This has been identified as one of the expected effects of climate change on biodiversity (Walther *et al.* 2009).

Climate change, including increased temperatures, decreased rainfall, and variation in daily/seasonal temperature ranges may facilitate the geographical extension of many invasive species, threatening native biodiversity (Caujape-Castells *et al.* 2010). Continuous monitoring and control of areas where non-native species are concentrated, including botanical gardens, personal gardens, landscaped public and government buildings, and commercial garden centers, among others, is recommended to prevent accidental escape and expansion of thermophile species favored by climate change in the near future, as has been recently suggested by McDougall *et al.* (2011). For Tenerife Island, golf courses are one of the main entrance of non-native species (Siverio 2012), becoming one of the main areas to control (not just the target species used for the field, also the involuntary introduce in the seeds and soil. The number of exotic species blacklisted should be expanded to include species that have an increased likelihood of becoming feral due to local warming. As it is revealed in this study, together with economic growth, the entrance of introduce species are expected to increase.

We cannot forget the importance of laws and regulation in order to control the movement an entrance of invasive and introduce species. A new Royal Decree Law (Real Decreto Ley 630/2013, 2013) has been enacted and approves to regulate the invasive and introduce species and stablishing strong limitations to the use.

Since 2007, the economic crisis has changed many socioeconomic variables in this study (study finished in 2010). Thus, in future studies, we will have a good opportunity to reveal the importance of the temperature anomalies (minimum and average) in species richness and composition. Clearly, multidisciplinary efforts will be necessary between ecologists and economists to reveal the external cost of the increasing presence of non-native species caused by economic growth. This will be valuable information before declaring and then facing battle against any future “biological invasion crises”.

Acknowledgments

This research contributes to the project CLIMAIMPACTO MAC/3/C159 within the MAC Transnational Cooperation Programme 2007-2013. CLIMAIMPACTO is supported by the Canary Islands Government Agency for Sustainable Development and Climate Change, in partnership with the Ministry of the Environment, Rural Development and Marine Resources of Cape Verde. The authors thank Professor Luis Cabrera of the Department of Spanish Economic History at the University of La Laguna for the Analysis of Variations in Gross Domestic Product in the Canary Islands. We thank Clive Tyrell for the help with the English edition of the manuscript.

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Received:
November 18th, 2015

Accepted:
March 31st, 2016

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Appendix 1. Pooled list of native endemic species for the decade in which were cited for the first time as indicated in Arechevala-Hernández et al. (2010).

Native endemic species		Decade	Native endemic species		Decade
<i>Andryala pinnatifida</i>	Aiton	1940	<i>Reichardia ligulata</i>	(Vent.) G. Kunkel & Sunding	1940
<i>Andryala webbii</i>	Sch. Bip. ex Christ	1940	<i>Schizogyne glaberrima</i>	DC.	1940
<i>Argyranthemum adauctum</i>	(Link) Humphries	1940	<i>Senecio bollei</i>	Sunding & G. Kunkel	1940
<i>Argyranthemum broussonetii</i>	(Pers.) Humphries	1940	<i>Senecio hermosae</i>	Pit.	1940
<i>Argyranthemum callichrysom</i>	(Svent.) Humphries	1940	<i>Senecio palmensis</i>	(C. Sm. in Buch) Link	1940
<i>Argyranthemum coronopifolium</i>	(Willd.) Humphries	1940	<i>Senecio teneriffae</i>	Sch. Bip.	1940
<i>Argyranthemum escaeirei</i>	(Svent.) Humphries	1950	<i>Sonchus acaulis</i>	Dum. Cours.	1940
<i>Argyranthemum filifolium</i>	(Sch. Bip.) Humphries	1940	<i>Sonchus bornmuelleri</i>	Pit.	1960
<i>Argyranthemum foeniculaceum</i>	(Willd.) Webb ex Sch. Bip.	1940	<i>Sonchus brachylobus</i>	Webb & Berthel.	1940
<i>Argyranthemum frutescens</i>	(L.) Sch. Bip.	1940	<i>Sonchus canariensis</i>	(Sch. Bip.) Boulos	1940
<i>Argyranthemum gracile</i>	Sch. Bip.	1940	<i>Sonchus congestus</i>	Willd.	1940
<i>Argyranthemum haouarytheum</i>	Humphries & Bramwell	1940	<i>Sonchus fauces-orci</i>	Knoche	1940
<i>Argyranthemum hierrense</i>	Humphries	1940	<i>Sonchus gandogeri</i>	Pit.	1940
<i>Argyranthemum lemsii</i>	Humphries	1940	<i>Sonchus gomerensis</i>	Boulos	1950
<i>Argyranthemum lidii</i>	Humphries	1940	<i>Sonchus gummifer</i>	Link	1940
<i>Argyranthemum maderense</i>	(D. Don) Humphries	1940	<i>Sonchus hierrensis</i>	(Pit.) Boulos	1940
<i>Argyranthemum sundingii</i>	L. Borgen	1990	<i>Sonchus lidii</i>	Boulos	1940
<i>Argyranthemum sventenii</i>	Humphries & Aldridge	1980	<i>Sonchus ortunoii</i>	Svent.	1950
<i>Argyranthemum teneriffae</i>	Humphries	1940	<i>Sonchus palmensis</i>	(Sch. Bip.) Boulos	1940
<i>Argyranthemum webbii</i>	Sch. Bip.	1940	<i>Sonchus pitardii</i>	Boulos	1960
<i>Argyranthemum winteri</i>	(Svent.) Humphries	1940	<i>Sonchus radicans</i>	Aiton	1940
<i>Artemisia ramosa</i>	C. Sm. in Buch	1940	<i>Sonchus tectifolius</i>	Svent.	1960
<i>Artemisia thuscula</i>	Cav.	1940	<i>Sonchus tuberifer</i>	Svent.	1940
<i>Asteriscus intermedius</i>	(DC.) Pit. & Proust	1940	<i>Sonchus wildpretii</i>	U. Reifenberger & A. Reifenberger	1980
<i>Asteriscus sericeus</i>	(L. f.) DC.	1940	<i>Stemmacantha cynaroides</i>	(C. Sm. in Buch) Dittrich	1940
<i>Atractylis arbuscula</i>	Svent. & Michaelis	1940	<i>Tanacetum ferulaceum</i>	(Webb) Sch. Bip.	1940
<i>Atractylis preauxiana</i>	Sch. Bip.	1940	<i>Tanacetum oshanahani</i>	"Marrero Rodr., Febles & Suárez"	1980
<i>Carduus baeocephalus</i>	Webb	1940	<i>Tanacetum ptarmiciflorum</i>	(Webb) Sch. Bip.	1940
<i>Carduus bourgeauii</i>	Kazmi	1940	<i>Tolpis calderae</i>	Bolle	1940
<i>Carduus clavulatus</i>	Link	1940	<i>Tolpis crassiuscula</i>	Svent.	1940
<i>Carduus volutarioides</i>	Reyes-Betancort	2000	<i>Tolpis glabrescens</i>	Kämmer	1940
<i>Carlina canariensis</i>	Pit.	1940	<i>Tolpis laciniata</i>	(Sch. Bip. ex Webb & Berthel.) Webb	1940
<i>Carlina falcata</i>	Svent.	1940	<i>Tolpis lagopoda</i>	C. Sm. in Buch	1940
<i>Carlina texedae</i>	Marrero Rodr.	1980	<i>Tolpis proustii</i>	Pit.	1940
<i>Carlina xeranthemoides</i>	L. f.	1940	<i>Tolpis webbii</i>	Sch. Bip. ex Webb & Berthel.	1940
<i>Crepis canariensis</i>	(Sch. Bip.) Babç.	1940	<i>Volutaria bollei</i>	(Sch. Bip. ex Bolle) A. Hansen & G. Kunkel	1940
<i>Erigeron calderae</i>	A. Hansen	1980	<i>Volutaria canariensis</i>	Wagenitz	1940
<i>Helichrysum alucense</i>	"García-Casanova, S. Scholz & Hernández"	1990	<i>Lavatera acerifolia</i>	Cav.	1940
<i>Helichrysum gossypinum</i>	Webb	1940	<i>Lavatera phoenicea</i>	Vent.	1940
<i>Helichrysum monogynum</i>	Burt & Sunding	1970	<i>Adenocarpus foliolosus</i>	(Aiton) DC.	1940
<i>Hypochoeris oligocephala</i>	(Svent. & Bramwell) Lack	1960	<i>Adenocarpus ombriosus</i>	Ceballos & Ortuño	1940
<i>Kleinia neriifolia</i>	Haw.	1940	<i>Adenocarpus viscosus</i>	(Willd.) Webb & Berthel.	1940
<i>Lactuca palmensis</i>	Bolle	1940	<i>Anagiris latifolia</i>	Brouss. ex Willd.	1940
<i>Laphangium teydeum</i>	Wildpret & Greuter	1940	<i>Chamaecytisus proliferus</i>	(L. f.) Link	1940
<i>Onopordon carduelium</i>	Bolle	1940	<i>Cicer canariense</i>	A. Santos & G. P. Lewis	1960
<i>Onopordon nogalesii</i>	Svent.	1950	<i>Dorycnium broussonetii</i>	(Choisy ex Ser. in DC.) Webb & Berthel.	1940
<i>Pericallis appendiculata</i>	(L. f.) B. Nord.	1940	<i>Dorycnium eriophthalmum</i>	Webb & Berthel.	1940
<i>Pericallis cruenta</i>	(L' Hér.) Bolle	1940	<i>Dorycnium spectabile</i>	(Choisy ex Ser. in DC.) Webb & Berthel.	1940
<i>Pericallis echinata</i>	(L. f.) B. Nord.	1940	<i>Genista benehoavensis</i>	(Bolle ex Svent.) del Arco	1940
<i>Pericallis hadrosoma</i>	(Svent.) B. Nord.	1940	<i>Lotus arinagensis</i>	Bramwell	1960
<i>Pericallis hansenii</i>	(G. Kunkel) Sunding	1980	<i>Lotus berthelotii</i>	Masf.	1940
<i>Pericallis lanata</i>	(L' Hér.) B. Nord.	1940	<i>Lotus callis-viridis</i>	Bramwell & D. H. Davis	1950
<i>Pericallis multiflora</i>	(L' Hér.) B. Nord.	1940	<i>Lotus campylocadus</i>	Webb & Berthel.	1940
<i>Pericallis murrayi</i>	(Bornm.) B. Nord.	1940	<i>Lotus dumetorum</i>	Webb ex R. P. Murray	1940
<i>Pericallis papyracea</i>	(DC.) B. Nord.	1940	<i>Lotus emeroides</i>	R. P. Murray	1940
<i>Pericallis steetzii</i>	(Bolle) B. Nord.	1940	<i>Lotus eremiticus</i>	A. Santos	1990
<i>Pericallis tussilaginis</i>	(L' Hér.) D. Don in Sweet	1940	<i>Lotus genistoides</i>	Webb	1970
<i>Pericallis webbii</i>	Sch. Bip. & Bolle	1940			
<i>Phagnalon umbelliforme</i>	DC.	1940			
<i>Pulicaria canariensis</i>	Bolle	1940			
<i>Reichardia crystallina</i>	(Sch. Bip.) Bramwell	1940			
<i>Reichardia famarae</i>	Bramwell & G. Kunkel ex Gallego & Talavera	1940			

Appendix 1. Continuation.

Native endemic species			Decade	Native endemic species			Decade
<i>Lotus hillebrandii</i>	Christ	1940		<i>Silene berthelotiana</i>	Webb	1940	
<i>Lotus holosericeus</i>	Webb & Berthel.	1940		<i>Silene bourgeau</i>	Webb ex Christ	1940	
<i>Lotus kunkelii</i>	(Esteve) Bramwell & D. H. Davis	1940		<i>Silene canariensis</i>	Willd.	1990	
<i>Lotus lancerottensis</i>	Webb & Berthel.	1940		<i>Silene lagunensis</i>	C. Sm. ex Christ	1940	
<i>Lotus maculatus</i>	Breitt.	1980		<i>Silene nocteolens</i>	Webb & Berthel.	1940	
<i>Lotus mascaensis</i>	Burchard	1940		<i>Silene sabinosae</i>	Pit.	1940	
<i>Lotus pyranthus</i>	P. Pérez	1980		<i>Silene tamaranae</i>	Bramwell	1940	
<i>Lotus sessilifolius</i>	DC.	1940		<i>Chenopodium coronopus</i>	Moq. in DC.	1940	
<i>Lotus spartioides</i>	Webb & Berthel.	1940		<i>Patellifolia webbiana</i>	“(Moq.) A. J. Scott, Ford-Lloyd & J. T. Williams”	1940	
<i>Ononis angustissima</i>	Lam.	1940		<i>Salsola divaricata</i>	Masson ex Link in Buch	1940	
<i>Ononis christii</i>	Bolle	1940		<i>Aeonium appendiculatum</i>	A. Bañares	1940	
<i>Ononis hebecarpa</i>	Webb & Berthel.	1940		<i>Aeonium arboreum</i>	(L.) Webb & Berthel.	1940	
<i>Retama rhodorhizoides</i>	Webb & Berthel.	1940		<i>Aeonium balsamiferum</i>	Webb & Berthel.	1940	
<i>Teline canariensis</i>	(L.) Webb & Berthel.	1940		<i>Aeonium canariense</i>	(L.) Webb & Berthel.	1940	
<i>Teline microphylla</i>	(DC.) P. E. Gibbs & Dingwall	1940		<i>Aeonium castello-paivae</i>	Bolle	1940	
<i>Teline nervosa</i>	(Esteve) A. Hansen & Sunding	1980		<i>Aeonium ciliatum</i>	(Willd.) Webb & Berthel.	1940	
<i>Teline osyrioides</i>	(Svent.) P. E. Gibbs & Dingwall	1940		<i>Aeonium cuneatum</i>	Webb & Berthel.	1940	
<i>Teline pallida</i>	(Poir.) G. Kunkel	1940		<i>Aeonium davidbramwellii</i>	H. Y. Liu	1940	
<i>Teline rosmarinifolia</i>	Webb & Berthel.	1940		<i>Aeonium decorum</i>	Webb ex Bolle	1940	
<i>Teline salsoloides</i>	del Arco & Acebes	1980		<i>Aeonium gomerense</i>	(Praeger) Praeger	1940	
<i>Teline splendens</i>	(Webb & Berthel.) del Arco	1940		<i>Aeonium goochiae</i>	(Webb & Berthel.) Webb & Berthel.	1940	
<i>Vicia chaetocalyx</i>	Webb & Berthel.	1940		<i>Aeonium haworthii</i>	(Salm-Dyck ex Webb & Berthel.) Webb & Berthel.	1940	
<i>Vicia cirrhosa</i>	C. Sm. ex Webb & Berthel.	1940		<i>Aeonium hierrense</i>	(R. P. Murray) Pit. & Proust	1940	
<i>Vicia filicaulis</i>	Webb & Berthel.	1960		<i>Aeonium lancerottense</i>	(Praeger) Praeger	1940	
<i>Vicia nataliae</i>	U. Reifenberger & Reifenberger	1990		<i>Aeonium lindleyi</i>	Webb & Berthel.	1940	
<i>Vicia scandens</i>	R. P. Murray	1940		<i>Aeonium nobile</i>	(Praeger) Praeger	1940	
<i>Justicia hyssopifolia</i>	L.	1940		<i>Aeonium percarneum</i>	(R. P. Murray) Pit.	1940	
<i>Camptoloma canariense</i>	(Webb & Berthel.) Hilliard	1940		<i>Aeonium pseudourbicum</i>	A. Bañares	1940	
<i>Campylanthus salsoloides</i>	(L. f.) Roth	1940		<i>Aeonium saundersii</i>	Bolle	1940	
<i>Isoplexis canariensis</i>	(L.) J. W. Loudon	1940		<i>Aeonium sedifolium</i>	(Webb ex Bolle) Pit. & Proust	1940	
<i>Isoplexis chalcantha</i>	Svent. & O'Shan.	1940		<i>Aeonium simsii</i>	(Sweet) Stearn	1940	
<i>Isoplexis isabelliana</i>	(Webb & Berthel.) Masf.	1940		<i>Aeonium smithii</i>	(Sims) Webb & Berthel.	1940	
<i>Kickxia pendula</i>	(G. Kunkel) G. Kunkel	1960		<i>Aeonium spathulatum</i>	(Hornem.) Praeger	1940	
<i>Kickxia scoparia</i>	(Brouss. ex Spreng.) G. Kunkel & Sunding	1940		<i>Aeonium tabulaeforme</i>	(Haw.) Webb & Berthel.	1940	
<i>Scrophularia calliantha</i>	Webb & Berthel.	1940		<i>Aeonium undulatum</i>	Webb & Berthel.	1940	
<i>Scrophularia glabrata</i>	Aiton	1940		<i>Aeonium urbicum</i>	(C. Sm. ex Buch) Webb & Berthel.	1940	
<i>Scrophularia smithii</i>	Hornem.	1940		<i>Aeonium valverdense</i>	(Praeger) Praeger	1940	
<i>Orobancha berthelotii</i>	Webb & Berthel.	1990		<i>Aeonium volkerii</i>	Hernández & A. Bañares	1940	
<i>Orobancha gratiosa</i>	(Webb & Berthel.) Linding.	1940		<i>Aichryson bethencourtianum</i>	Bolle	1940	
<i>Globularia ascanii</i>	Bramwell & G. Kunkel	1980		<i>Aichryson bituminosum</i>	A. Bañares	1940	
<i>Globularia sarcophylla</i>	Svent.	1950		<i>Aichryson bollei</i>	Webb ex Bolle	1940	
<i>Plantago asphodeloides</i>	Svent.	1940		<i>Aichryson brevipetalum</i>	Praeger	1940	
<i>Plantago famarae</i>	Svent.	1940		<i>Aichryson laxum</i>	(Haw.) Bramwell	1940	
<i>Plantago webbii</i>	Barnéoud	1940		<i>Aichryson pachycaulon</i>	Bolle	1940	
<i>Bosea yervamora</i>	L.	1940		<i>Aichryson palmense</i>	Webb ex Bolle	1940	
<i>Cerastium sventenii</i>	Jalas	1940		<i>Aichryson parlatoei</i>	Bolle	1940	
<i>Herniaria canariensis</i>	Chaudhri	1960		<i>Aichryson porphyrogennetos</i>	Bolle	1940	
<i>Herniaria hartungii</i>	Parl.	1940		<i>Aichryson punctatum</i>	(C. Sm. ex Buch) Webb & Berthel.	1940	
<i>Minuartia platyphylla</i>	(Gay ex Christ) McNeill	1940		<i>Aichryson tortuosum</i>	(Aiton) Webb & Berthel.	1940	
<i>Minuartia webbii</i>	McNeill & Bramwell	1940		<i>Monanthes anagensis</i>	Praeger	1940	
<i>Paronychia canariensis</i>	(L. f.) Juss.	1940		<i>Monanthes brachycaulos</i>	(Webb in Webb & Berthel.) Lowe	1940	
<i>Polycarpaea aristata</i>	(Aiton) DC.	1940		<i>Monanthes ictérica</i>	(Webb ex Bolle) Christ	1940	
<i>Polycarpaea carnosa</i>	C. Sm. ex Buch	1940		<i>Monanthes laxiflora</i>	(DC.) Bolle	1940	
<i>Polycarpaea divaricata</i>	(Aiton) Poir.	1940		<i>Monanthes minima</i>	(Bolle) Christ	1940	
<i>Polycarpaea filifolia</i>	Webb ex Christ	1940		<i>Monanthes muralis</i>	(Webb ex Bolle) Hook. f.	1940	
<i>Polycarpaea latifolia</i>	Willd.	1940		<i>Monanthes pallens</i>	(Webb ex Christ) Christ	1940	
<i>Polycarpaea robusta</i>	(Pit.) G. Kunkel	1990		<i>Monanthes polyphylla</i>	Haw.	1940	
<i>Polycarpaea smithii</i>	Link	1940					
<i>Polycarpaea tenuis</i>	Webb ex Christ	1940					

Appendix 1. Continuation.

Native endemic species			Decade	Native endemic species			Decade
<i>Monanthes wildpretii</i>	A. Bañares & S. Scholz	1980		<i>Crambe gomerae</i>	Webb ex Christ	1940	
<i>Bencomia brachystachya</i>	Svent. ex Nordborg	1940		<i>Crambe laevigata</i>	DC. ex Christ	1940	
<i>Bencomia exstipulata</i>	Svent.	1950		<i>Crambe microcarpa</i>	A. Santos	1980	
<i>Bencomia sphaerocarpa</i>	Svent.	1940		<i>Crambe pritzelii</i>	Bolle	1940	
<i>Marcetella moquiniana</i>	(Webb & Berthel.) Svent.	1940		<i>Crambe santosii</i>	Bramwell	1940	
<i>Rubus palmensis</i>	A. Hansen	1970		<i>Crambe scaberrima</i>	Webb ex Bramwell	1940	
<i>Ruta microcarpa</i>	Svent.	1940		<i>Crambe scoparia</i>	Svent.	1950	
<i>Ruta oreojasme</i>	Webb	1940		<i>Crambe strigosa</i>	L'Hér.	1940	
<i>Ruta pinnata</i>	L. f.	1940		<i>Crambe sventenii</i>	Pett. ex Bramwell & Sunding	1950	
<i>Bystropogon canariensis</i>	(L.) L'Hér.	1940		<i>Crambe tamadabensis</i>	A. Prina & Á. Marrero	1980	
<i>Bystropogon odoratissimus</i>	Bolle	1940		<i>Crambe wildpretii</i>	A. Prina & Bramwell	1960	
<i>Bystropogon organifolius</i>	L'Hér.	1940		<i>Descurainia artemisioides</i>	Svent.	1940	
<i>Bystropogon plumosus</i>	(L. f.) L'Hér.	1940		<i>Descurainia bourgeauana</i>	(E. Fourn.) O. E. Schulz	1940	
<i>Bystropogon wildpretii</i>	La Serna	1960		<i>Descurainia gilva</i>	Svent.	1940	
<i>Lavandula bramwellii</i>	Upson & S. Andrews	1980		<i>Descurainia gonzalesii</i>	Svent.	1940	
<i>Lavandula buchii</i>	Webb	1940		<i>Descurainia lemsii</i>	Bramwell	1940	
<i>Lavandula canariensis</i>	Mill.	1940		<i>Descurainia millefolia</i>	(Jacq.) Webb & Berthel.	1940	
<i>Lavandula minutolii</i>	Bolle	1940		<i>Descurainia preauxiana</i>	(Webb) O. E. Schulz	1940	
<i>Micromeria benthamii</i>	Webb & Berthel.	1940		<i>Erucastrum canariense</i>	Webb & Berthel.	1940	
<i>Micromeria glomerata</i>	P. Pérez	1970		<i>Erysimum albescens</i>	(Webb & Berthel.) Bramwell	1940	
<i>Micromeria helianthemifolia</i>	Webb & Berthel.	1940		<i>Erysimum scoparium</i>	(Brouss. ex Willd.) Wettst.	1940	
<i>Micromeria herpyllomorpha</i>	Webb & Berthel.	1940		<i>Matthiola bolleana</i>	Webb ex Christ	1940	
<i>Micromeria hyssopifolia</i>	Webb & Berthel.	1940		<i>Reseda crystallina</i>	Webb & Berthel.	1940	
<i>Micromeria lachnophylla</i>	Webb & Berthel.	1940		<i>Reseda scoparia</i>	Brouss. ex Willd.	1940	
<i>Micromeria lanata</i>	(C. Sm. ex Link) Benth.	1940		<i>Ammodaucus nanocarpus</i>	(E. Beltrán) P. Pérez & A. Velasco	1940	
<i>Micromeria lasiophylla</i>	Webb & Berthel.	1940		<i>Bupleurum handiense</i>	(Bolle) G. Kunkel	1940	
<i>Micromeria lepida</i>	Webb & Berthel.	1940		<i>Cryptotaenia elegans</i>	Webb ex Bolle	1940	
<i>Micromeria leucantha</i>	Svent. ex P. Pérez	1980		<i>Ferula lancerottensis</i>	Parl.	1940	
<i>Micromeria pineolens</i>	Svent.	1940		<i>Ferula latipinna</i>	A. Santos	1980	
<i>Micromeria rivas-martinezii</i>	Wildpret	1980		<i>Ferula linkii</i>	Webb	1940	
<i>Micromeria teneriffae</i>	(Poir.) Benth.	1940		<i>Pimpinella anagodendron</i>	Bolle	1940	
<i>Micromeria tenuis</i>	(Link) Webb & Berthel.	1940		<i>Pimpinella cumbrae</i>	Link	1940	
<i>Nepeta teydea</i>	Webb & Berthel.	1940		<i>Pimpinella dendrotragium</i>	Webb	1940	
<i>Salvia broussonetii</i>	Benth.	1940		<i>Pimpinella junoniae</i>	Ceballos & Ortuño	1940	
<i>Salvia canariensis</i>	L.	1940		<i>Pimpinella rupicola</i>	Svent.	1940	
<i>Salvia herbanica</i>	A. Santos & M. Fernández	1980		<i>Seseli webbii</i>	Coss.	1940	
<i>Sideritis amagroi</i>	Marrero Rodr. & Navarro	1990		<i>Echium acanthocarpum</i>	Svent.	1950	
<i>Sideritis barbellata</i>	Mend.-Heuer	1940		<i>Echium aculeatum</i>	Poir.	1940	
<i>Sideritis brevicaulis</i>	Mend.-Heuer	1940		<i>Echium auberianum</i>	Webb & Berthel.	1940	
<i>Sideritis canariensis</i>	L.	1940		<i>Echium bethencourtii</i>	A. Santos	1980	
<i>Sideritis cretica</i>	L.	1940		<i>Echium bonnetii</i>	Coincy	1940	
<i>Sideritis cystosiphon</i>	Svent.	1960		<i>Echium breviflorum</i>	Sprague & Hutch.	1940	
<i>Sideritis dasygnaphala</i>	(Webb & Berthel.)	1940		<i>Echium callithyrsus</i>	Webb ex Bolle	1940	
<i>Sideritis dendro-chahorra</i>	Clos emend. Svent.			<i>Echium decaisnei</i>	Webb	1940	
<i>Sideritis discolor</i>	Bolle	1940		<i>Echium gentianoides</i>	Webb ex Coincy	1940	
<i>Sideritis eriocephala</i>	Marrero Rodr. ex Negrín & P. Pérez	1940		<i>Echium giganteum</i>	L. f.	1940	
<i>Sideritis ferrensis</i>	P. Pérez & Negrín	1950		<i>Echium handiense</i>	Svent.	1940	
<i>Sideritis gomerae</i>	Bolle	1940		<i>Echium hierrense</i>	Webb ex Bolle	1940	
<i>Sideritis infernalis</i>	Bolle	1940		<i>Echium lancerottense</i>	Lems & Holzapfel	1940	
<i>Sideritis kugleriana</i>	Bornm.	1940		<i>Echium leucophaeum</i>	Webb ex Sprague & Hutch.	1940	
<i>Sideritis lotsyi</i>	(Pit.) Bornm.	1940		<i>Echium onosmifolium</i>	Webb	1940	
<i>Sideritis macrostachys</i>	Poir.	1940		<i>Echium pininana</i>	Webb & Berthel.	1940	
<i>Sideritis marmorea</i>	Bolle	1940		<i>Echium simplex</i>	DC.	1940	
<i>Sideritis nervosa</i>	(Christ) Linding.	1940		<i>Echium strictum</i>	L. f.	1940	
<i>Sideritis nutans</i>	Svent.	1950		<i>Echium sventenii</i>	Bramwell	1960	
<i>Sideritis oroteneriffae</i>	Negrín & P. Pérez	1940		<i>Echium triste</i>	Svent.	1940	
<i>Sideritis pumila</i>	(Christ) Mend.-Heuer	1940		<i>Echium virescens</i>	DC.	1940	
<i>Sideritis soluta</i>	Clos	1940		<i>Echium webbii</i>	Coincy	1940	
<i>Sideritis sventenii</i>	(G. Kunkel) Mend.-Heuer	1970		<i>Echium wildpretii</i>	Pearson ex Hook. f.	1940	
<i>Thymus origanoides</i>	Webb & Berthel.	1940		<i>Euphorbia aphylla</i>	Brouss. ex Willd.	1940	
<i>Brassica bourgeau</i>	(Webb ex Christ) Kuntze	1940		<i>Euphorbia atropurpurea</i>	(Brouss.) Webb & Berthel.	1940	
<i>Crambe arborea</i>	Webb ex Christ	1940		<i>Euphorbia berthelotii</i>	Bolle	1940	
				<i>Euphorbia bourgeauana</i>	Gay ex Boiss. in DC.	1940	

Appendix 1. Continuation.

Native endemic species		Decade	Native endemic species		Decade
<i>Euphorbia bravoana</i>	Svent.	1940	<i>Olea cerasiformis</i>	Rivas-Mart. & del Arco	1940
<i>Euphorbia canariensis</i>	L.	1940	<i>Limonium arborescens</i>	(Brouss.) Kuntze	1940
<i>Euphorbia handiensis</i>	Burchard	1940	<i>Limonium benmageci</i>	Marrero Rodr. in	2000
<i>Euphorbia lamarckii</i>	Sweet	1940		Marrero Rodr. & Almeida	
<i>Euphorbia lambii</i>	Svent.	1950	<i>Limonium bourgeau</i>	(Webb ex Boiss.) Kuntze	1940
<i>Arbutus canariensis</i>	Veill.	1940	<i>Limonium brassicifolium</i>	(Webb & Berthel.) Kuntze	1940
<i>Erica platycodon</i>	(Webb & Berthel.)	1940	<i>Limonium dendroides</i>	Svent.	1950
	Rivas-Mart. & al.		<i>Limonium fruticans</i>	(Webb) Kuntze	1940
<i>Fumaria coccinea</i>	Lowe ex Pugsley	1980	<i>Limonium imbricatum</i>	(Webb ex Girard) C. F.	1940
<i>Ceropegia dichotoma</i>	Haw.	1940		Hubb.	
<i>Ceropegia fusca</i>	Bolle	1940	<i>Limonium macrophyllum</i>	(Brouss.) Kuntze	1940
<i>Phyllis viscosa</i>	Webb ex Christ	1940	<i>Limonium perezii</i>	(Stapf) C. F. Hubb.	1940
<i>Normania nava</i>	(Webb & Berthel.)	1940	<i>Limonium preauxii</i>	(Webb & Berthel.) Kuntze	1940
	Franc.-Ort. & R. N. Lester		<i>Limonium puberulum</i>	(Webb) Kuntze	1940
<i>Solanum lidii</i>	Sunding	1960	<i>Limonium redivivum</i>	(Svent.) G. Kunkel &	1950
<i>Solanum vespertilio</i>	Aiton	1940		Sunding	
<i>Convolvulus canariensis</i>	L.	1940	<i>Limonium relicticum</i>	R. Mesa & A. Santos	2000
<i>Convolvulus caput-medusae</i>	Lowe	1940	<i>Limonium spectabile</i>	(Svent.) G. Kunkel &	1940
<i>Convolvulus floridus</i>	L. f.	1940		Sunding	
<i>Convolvulus fruticosus</i>	Desr.	1940	<i>Limonium sventenii</i>	A. Santos & M. Fernández	1970
<i>Convolvulus glandulosus</i>	(Webb) Hallier f.	1940	<i>Limonium vigaroense</i>	Marrero Rodr. & Almeida	2000
<i>Convolvulus lopezsocasi</i>	Svent.	1940	<i>Maytenus canariensis</i>	(Loes.) G. Kunkel &	1940
<i>Convolvulus perraudieri</i>	Coss.	1940		Sunding	
<i>Convolvulus scoparius</i>	L. f.	1940	<i>Myrica rivas-martinezii</i>	A. Santos	1980
<i>Convolvulus subauriculatus</i>	(Burchard) Linding.	1940	<i>Rhamnus crenulata</i>	Aiton	1940
<i>Convolvulus volubilis</i>	Link in Buch	1940	<i>Rhamnus integrifolia</i>	DC.	1940
<i>Bryonia verrucosa</i>	Dryand.	1940	<i>Sideroxylon canariensis</i>	"T. Leyens, W. Lobin &	1940
<i>Campanula occidentalis</i>	Y. Nyman	1940		A. Santos"	
<i>Canarina canariensis</i>	(L.) Vatke	1940	<i>Arrhenatherum calderae</i>	A. Hansen	1940
<i>Forsskaolea angustifolia</i>	Retz.	1940	<i>Avena canariensis</i>	"R. Baum, Rajhathy &	1940
<i>Gesnouinia arborea</i>	(L. f.) Gaudich.	1940		D. R. Sampson"	
<i>Parietaria filamentosa</i>	Webb & Berthel.	1940	<i>Brachypodium arbuscula</i>	Knoche	1940
<i>Urtica stachyoides</i>	Webb & Berthel.	1940	<i>Dactylis metlesicisii</i>	Schönfelder & Ludwig	1980
<i>Pteroccephalus dumetorus</i>	(Brouss. ex Willd.) Coult.	1940	<i>Festuca agustinii</i>	Linding.	1940
<i>Pteroccephalus lasiospermus</i>	Link ex Buch	1940	<i>Lolium edwardii</i>	"H. Scholz, Stierstorfer	1940
<i>Pteroccephalus porphyranthus</i>	Svent.	1940		& v.Gaisberg"	
<i>Pteroccephalus virens</i>	Webb & Berthel.	1940	<i>Melica teneriffae</i>	Hack. ex Christ	1940
<i>Sambucus palmensis</i>	Link	1940	<i>Oropetium capense</i>	Stapf	2000
<i>Viburnum rigidum</i>	Vent.	1940	<i>Poa pitardiana</i>	H. Scholz	1940
<i>Cistus asper</i>	Demoly & R. Mesa	2000	<i>Trisetaria lapalmae</i>	H. Scholz	1980
<i>Cistus chinamadensis</i>	A. Bañares & P. Romero	1980	<i>Asparagus arborescens</i>	Willd.	1940
<i>Cistus horrens</i>	Demoly	1960	<i>Asparagus fallax</i>	Svent.	1940
<i>Cistus ocreatus</i>	C. Sm. in L. von Buch	1940	<i>Asparagus plocamoides</i>	Webb ex Svent.	1940
<i>Cistus osbeckiifolius</i>	Webb & Christ	1940	<i>Semele gayae</i>	(Webb) Svent. & G. Kunkel	1940
<i>Cistus palmensis</i>	Bañares & Demoly	2000	<i>Pancratium canariense</i>	Ker-Gawl.	1940
<i>Cistus symphytifolius</i>	Lam.	1940	<i>Dracaena tamaranae</i>	"Marrero Rodr., Almeida-	1980
<i>Helianthemum bramwelliorum</i>	Marrero Rodr.	1990		Pérez & González-Martín"	
<i>Helianthemum broussonetii</i>	Dunal ex DC.	1940	<i>Scilla dasyantha</i>	Webb & Berthel.	1940
<i>Helianthemum bystropogophyllum</i>	Svent.	1950	<i>Scilla haemorrhoidalis</i>	Webb & Berthel.	1940
<i>Helianthemum gonzalezferreri</i>	Marrero Rodr.	1990	<i>Androcymbium hierrense</i>	A. Santos	1980
<i>Helianthemum inaguae</i>	"Marrero Rodr., González-	1980	<i>Androcymbium psammophilum</i>	Svent.	1940
	Martín & González-Artiles"		<i>Dracunculus canariensis</i>	Kunth	1940
<i>Helianthemum juliae</i>	Wildpret	1980	<i>Carex canariensis</i>	Kük.	1940
<i>Helianthemum teneriffae</i>	Coss.	1940	<i>Carex perraudieriana</i>	Gay ex Bornm.	1940
<i>Helianthemum tholiforme</i>	"Bramwell, J. Ortega &	1980	<i>Luzula canariensis</i>	Poir.	1940
	B. Navarro"		<i>Habenaria tridactylites</i>	Lindl.	1940
<i>Helianthemum thymiphyllum</i>	Svent.	1950	<i>Himantoglossum metlesicsianum</i>	(W. P. Teschner) P. Delforge	1970
<i>Viola anagae</i>	Gilli	1980	<i>Serapias mascaensis</i>	"H. Kretzschmar, G.	1990
<i>Viola cheiranthifolia</i>	Humb. & Bonpl.	1940		Kretzschmar & Kreutz"	
<i>Viola palmensis</i>	Webb & Berthel.	1940	<i>Phoenix canariensis</i>	Chabaud	1940
<i>Rumex lunaria</i>	L.	1940	<i>Pinus canariensis</i>	C. Sm. ex DC. in Buch	1940
<i>Geranium reuteri</i>	Aedo & Muñoz Garm.	1940	<i>Asplenium terorense</i>	G. Kunkel	1960
<i>Hypericum coadunatum</i>	C. Sm. ex Link	1940	<i>Dryopteris oligodonta</i>	(Desv.) Pic.-Serm.	1940
<i>Hypericum reflexum</i>	L. f.	1940			