Biological Conservation 142 (2009) 1754–1766

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Use of the Biological Flora framework in the United Kingdom Overseas Territories: *Euphorbia origanoides* L.

Alan Gray [a,*], Paul David Robinson [b], Stedson Stroud [c]

[a] Centre for Ecology and Hydrology, Edinburgh Research Station, Bush Estate, Penicuik, Midlothian, Scotland EH26 0QB, UK
[b] Joint Nature Conservation Committee, Monkstone House, City Road, Peterborough PE1 1JY, UK
[c] Ascension Island Conservation, Conservation Centre, Georgetown, Ascension Island, ASCN IZZ, South Atlantic Ocean, UK

ARTICLE INFO

Article history:
Received 5 November 2008
Received in revised form 13 March 2009
Accepted 15 March 2009
Available online 11 April 2009

Keywords:
Euphorbia
Plant conservation
Endemic species
Germination
Herbivory
Reproductive biology
Ascension Island
Ascension spurge

ABSTRACT

The United Kingdom Overseas Territories (UKOTs) are globally important for a high diversity of endemic and threatened plant species but are poorly represented in plant ecological literature. This lack of ecological research is compounded by a lack of funding and skills. Cost effective approaches of compiling conservation relevant information are required. Here we present the first examination of a species from the UKOTs presented within the standard framework of a Biological Flora. This framework allows a convenient way to compile ecological information and assess missing data. The account reviews all available information on *Euphorbia origanoides* L. (Ascension spurge) from Ascension Island (South Atlantic Ocean) relevant to understanding its ecology and conservation, including soil chemistry, climate and plant community data. *E. origanoides* is an endemic perennial, found in dry, lava plains of Ascension Island with soils comprised of weathered volcanic scoria. *E. origanoides* has suffered habitat loss through the introduction of invasive species and survival in the wild is currently under threat. We relate the information gathered for this Biological Flora to the conservation of the species in the wild and propose the framework should be used as one way of compiling information relevant for conservation managers. The framework is beneficial as it allows an evidence-based approach to conservation but also permits the prioritisation of research and can help conservation managers to meet targets for the Convention on Biological Diversity and the Global Strategy for Plant Conservation.

1. Introduction

The United Kingdom Overseas Territories (UKOTs) are globally important for the high diversity of endemic and threatened plant species they contain but are poorly represented in plant ecological literature. This lack of ecological research is further compounded by a distinct lack of funding for conservation efforts. Funding deficits are a pervasive problem in the UKOTs; at present funding mainly consists of the Overseas Territory Environment Programme currently at about £1.5 million per year, representing a shortfall of around £15 million (RSPB, 2007). This deficit is augmented to some extent by programmes such as the Darwin Initiative and a number of territories have been successful in gaining Darwin Initiative funding. As of the 31st of March 2008 the Darwin Initiative has contributed over £3 million to biodiversity conservation in the Pacific Islands, the Caribbean and the Atlantic Islands which include many UKOTs (Anon, 2008). However, even this significant contribution to conservation does not address the funding shortfall. In comparison, UK public expenditure on biodiversity for 2004–2005 was estimated to be around £300 million (DEFRA; http://www.defra.gov.uk/environment/statistics/supp/spkf20.htm (accessed 13.01.09)). The funding bias towards the UK mainland may not be the most effective use of available funds, particularly given the rich biodiversity found in the UKOTs. For example, 180 endemic plant species are found in the UKOTS compared to 72 in mainland UK; 26 of these UK species are at the sub-specific level, four are doubtful and one is regarded as only probably endemic (Stace, 1997, see also http://www.nhm.ac.uk/nature-online/life/plants-fungi/postcode-plants/checklist-british-endemic-plants.html). There are also a greater number of threatened species in UKOTs (nearly 10 times the number of threatened species are found in the UKOTs, 2259 species, cf. 379 in mainland UK as listed by the IUCN). This suggests that a modest provision of funding towards the UKOT's could yield a substantial global biodiversity gain. Undoubtedly, this would be an effective means of meeting some of the UKs' obligations under the Convention on Biological Diversity (CBD) and towards targets of the Global Strategy for Plant Conservation. In addition this would go some way to delivering the principles and commitments laid down in the Environmental Charter of each individual territory and hence territory obligations to CBD. However, the problem is not just one of finances there is also a lack of specialised skills and/or the specific expertise required

* Corresponding author. Tel.: +44 131 445 8471; fax: +44 131 445 3943.
E-mail address: alangray@ceh.ac.uk (A. Gray).

0006-3207/$ - see front matter © 2009 Elsevier Ltd. All rights reserved.
doi:10.1016/j.biocon.2009.03.014

for conservation programme implementation and sustainability in UKOTs.

At present funding is not forthcoming, therefore, cost effective methods of compiling conservation relevant information are required as much to avoid wasting limited resources as to highlight technical capacity and applied research requirements. In 1928 Professor E.J. Salisbury put forward a proposal for a British 'Biological' Flora; the first accounts being published in 1941 (Anon, 1941). The species accounts consist of a standardised format which has remained relatively consistent with similar formats being adopted worldwide (e.g. Wehi and Clarkson, 2007). Thus, it provides a well-understood framework for collating and reviewing autecological information on rare and endangered species relevant to conservation. In most cases only relatively complete accounts have been published. However, for the purpose of compiling rare species information, the standard framework allows the identification of missing data. This can be of almost equal importance when setting conservation/research agendas on a limited budget; both in terms of finance and skills base.

Here we present the first examination of a species from the UKOTs presented within the standard framework of a *Biological Flora*. We propose that this framework is one method to allow conservation managers not only to act on the information gathered but aid the prioritisation of research needs for threatened plant species and ecosystems.

2. Methods

This account reviews all available information on *Euphorbia origanoides* L. (Ascension spurge) from Ascension Island (South Atlantic Ocean) relevant to understanding its ecology and conservation. Sources have included reports, peer reviewed papers, and herbarium specimens.

3. Biological flora

3.1. Taxonomy

Family: Euphorbiaceae sensu stricto (APGII).
Scientific Name: *Euphorbia origanoides* L. (sub-genus *Chamaesyce*).
Common Name: Ascension spurge.

E. origanoides L. is a perennial dwarf shrub. Plants form hemispherical domes that can extend over 1 m in diameter, Table 1. Stems are usually reddish (though sometimes only on the upper side), dichotomously branched, possessing white latex with older woody growth at the base. Tap roots can reach over 1 m (Gray, 2003), however, this is undoubtedly an underestimate as roots are prone to snapping; to our knowledge only one large mature plant has ever been excavated to this extent.

Stipules are broadly ovate hyaline and fringed, becoming brown with age. Leaves are opposite, shortly petiolate, asymmetrically cordate, with distinctly toothed margins and are conspicuously 3–5 nerved. Upper leaf surface is glabrous, dark green or glaucous green; the lower side is a paler glaucous green when fresh.

Flowers borne at the tips of branches in leaf axils, monoecious in distinctive small units composed of one female and many male flowers grouped together in a cup shaped cyathium with four conspicuous glands at top. Cyathia are solitary in terminal compound cymes with paired branches each subtended by a bract which is leafy but more elongated than the leaves. Perianth absent though the four glands are creamy-yellowy-white in colour giving the appearance of true flowers. Stamens 1–3 mm long with jointed filament, ovary and fruit 3 (4) celled with 1 ovule per cell. Fruit a glabrous schizocarp approximately 1–2 mm in diameter, seeds are approximately 0.5–1 mm; see Fig. 1.

No known variants have been described although populations show some variation in height and diameter (Table 1). The extent to which this variation is environmentally or genetically determined has not yet been explored. Fig. 2 shows the general habit, flowers, fruits and likely pollinators including members of Hemiptera and Diptera.

E. origanoides is confined to lower more arid regions of Ascension Island where soils are largely composed of weathered scoria and volcanic debris.

3.2. Geographical and altitudinal distribution

E. origanoides is one of 10 endemic vascular species from Ascension Island (97 km^2) a volcanic island in the South Atlantic Ocean (7°57′S, 14°22′W) four of which are now considered extinct (Ashmole and Ashmole, 2000; Cronk, 1980; Gray et al., 2005). Ascension Island, discovered in 1701, was permanently settled in 1815 just a few days after Napoleons' imprisonment on St Helena (Ashmole and Ashmole, 2000). Around 1845 a large scale programme of plant introductions began that has resulted in large changes to Ascensions' vegetation (Ashmole and Ashmole, 2000; Cronk, 1980; Duffey, 1964).

Fig. 3 shows a simplified habitat map characterised from satellite imagery and altitudinal vegetation zones as delimited by Stüder (1889) which were also adopted by Duffey (1964), Gray et al. (2005) summarised the main changes since the visits of Stüder and Duffey which together with the data compiled for Fig. 3 form the basis of the following descriptions.

Zone 1: This is an arid area of lava fields and low craters below 330 m and is characteristically where *E. origanoides* L. is now found. The vegetation remains similar to the description of Duffey (1964), with very patchy but often extensive vegetation, and abundant annual species appearing after rainfall events especially grasses. In addition to *E. origanoides*, species present in this zone include the native *Aristida adscensionis* L., *Portulaca oleracea* L. and *Cyperus appendiculatus* Kunth, and the introduced *Tecoma stans* (L.) Juss. ex Kunth, *Enneapogon cenchroides* (Licht.) C.E.Hubb., *Argemone mexicanca* L., *Heliotropium curassavicum* L., *Nicotiana glauca* R.Grah., and *Waltheria indica* L. The most notable change since Stüder (1889) and Duffey (1964) is the abundance of *Prosopis juliflora* (Sw.) DC, now dominating areas of this zone particularly in the west (Fig. 3) appearing to have displaced much of the *Acacia* scrub described by Duffey (1964).

Zone 2: This area lies between 330 and 660 m and has a more complete coverage of vegetation than zone 1 including scrub, woodland, and grassland habitats. Characteristic species include native *A. adscensionis*, *P. oleracea*, *Ipomoea pes-caprae* (L.) R. Br. and *Nephrolepis hirsutula* (G. Forst.) C. Presl and the introduced *P. juliflora*, *Juniperus bermudiana* L., *Causurina equisetifolia* L., *T. stans*, *Opuntia* sp., *Leucaena leucocephala* (Lam.) de Wit, *Lantana camara* L., *N. glauca, Psidium guajava* L., and *Acacia* spp.. As described by Duffey (1964) this is the zone where the grass *Melinis minutiflora* P. Beauv. attains its greatest abundance. As far as is known this area has never been occupied by *E. origanoides* (though, see Section 3.3). Mainly centred on Green Mountain, this zone and zone 3 below would have been the main areas for the extinct endemic species *Anogramma ascensionis* (Hook.) Diels, *Dryopteris ascensionis* (Hook.) Kuntze, *Oldenlandia adscensionis* (DC.) Cronk, and *Sporobolus durus* Brongn.; and currently accommodate the extant endemic species *Asplenium ascensionis* Watson *Marattia purpurascens* de Vriese *Pteris adscensionis* (Forst.) Sw., *Sporobolus caespitosus* Kunth, and *Xiphopteris ascensionense* (Hieron.) Cronk.

Zone 3: An area often covered in mist extending from 660 to 850 m and previously wrongly described as rainforest (Pearce,