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IMPORTANT PLANT AREAS IN THE ARABIAN PENINSULA

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An Important Plant Area programme has been initiated for the Arabian region by the IUCN Arabian Plant Specialist Group. The aim of this programme is to assess hotspots of plant diversity in the region and designate the most important as Important Plant Areas. These assessments are conducted on the basis of specific criteria and this paper presents the criteria which have been adopted for the Arabian Peninsula countries of Saudi Arabia, Oman and Yemen. These Arabian criteria differ from those originally developed for Europe, and so they are presented here in full. This paper also discusses the context of the Important Plant Area programme and its ability to provide a framework for conservation planning.

Keywords. Arabia, conservation, Important Plant Area, Key Biodiversity Area.

Introduction

Important Plant Areas are the most important places in the world for wild plant diversity that can be managed and protected as specific sites (Anderson, 2002; Plantlife International, 2004). Inspired by the success of Birdlife International's Important Bird Areas, Plantlife International has developed the Important Plant Area (IPA) programme as a response to the global biodiversity crisis and as a specific means of countering the loss of wild plant species and habitats. The IPA programme has both arisen from, and aims to support, the implementation of a number of global conservation treaties, particularly the Convention on Biological Diversity (CBD) and the CBD Global Strategy for Plant Conservation (GSPC) (Plantlife International, 2004). Target 5 of the GSPC states that 'Protection of 50% of the most important areas for plant diversity [should be] assured by 2010', and IPAs are primarily conceived as a framework for highlighting and mapping the occurrence of these

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botanically diverse areas (Secretariat of the Convention on Biological Diversity, 2002).

The IPA programme is also conceived as a method of contributing towards other GSPC targets for 2010 (Targets 2, 4, 7, 13–16) as well as the implementation of CBD articles 6, 7, 8, 12 and 13 on *in situ* biodiversity conservation and international co-operation. The recognition and protection of Important Plant Areas also contributes to Goal 1.1 of the CBD programme of work on protected areas, particularly the rapid identification of biodiversity-rich sites which are not within current protected areas, but which require urgent conservation protection.

The IPA programme is international in scope. Initially, IPAs were identified in 13 countries across Europe, but since 2004 IPA projects have been established across southern Africa, New Zealand and central Asia. In May 2005 the IUCN Arabian Plant Specialist Group (APSG) agreed to establish a coordinated IPA programme covering the partner countries of Bahrain, Saudi Arabia, Oman, Yemen, Kuwait, United Arab Emirates, Jordan, Palestine, Lebanon, Syria, Iraq and Qatar. Whilst conceived regionally, these programmes will be orchestrated on a national basis, reflecting the realities of conservation planning and funding (Brooks *et al.*, 2006). In line with this, the current paper considers the development of the IPA programme in the Arabian Peninsula countries of Saudi Arabia, Oman and Yemen. It is hoped that the criteria under discussion here will shortly be extended to all the countries in the APSG region.

Important Plant Areas were chosen as a framework for conservation initiatives in the region for a number of reasons. The IPA approach is regarded as a flexible tool for conservation assessment, which, importantly, can be used at both regional and national levels. It is an instrument that is able to bridge the *knowing–doing* gap because IPA selection often entails detailing the 'actions required to manifest conservation opportunities at areas identified as important for achieving conservation goals' (Knight *et al.*, 2008). Important Plant Area criteria can be applied rapidly, predominantly using existing datasets, and therefore represent a pragmatic method of highlighting areas of high botanical importance. These criteria are applicable to sites of varying sizes, from pockets of vegetation less than 1 ha in area, to large mountain ranges, for example Jabal Qaraqir. The IPA criteria recognise both the irreplaceability and vulnerability of biodiversity at both species and ecosystem levels.

Important Plant Areas are conceived as a subset of the Key Biodiversity Areas (KBA) (IUCN, 2007). However, although both concepts are closely aligned in terms of their objectives, there are significant methodological differences between these two approaches to conservation assessment. The KBA criteria use globally threatened species as surrogates for biodiversity (Eken *et al.*, 2004). This approach has been criticised by Knight *et al.* (2007) as being overly prescriptive and unable to deal with landscape connectivity. In the context of plant conservation we can add the constructive criticism that the KBA approach fails to take into account the ecosystem component of biological diversity. Although they are regarded as a subset of KBA's, IPA criteria are more applicable for plant conservation (and perhaps conservation in

general) with their recognition of the importance of species assemblages, plant habitats or vegetation types.

The IPA criteria are also more suited to the mainland Arabian region as they recognise the importance of biodiversity at global, regional and national levels. Southwest Arabia is recognised as part of a globally important biodiversity hotspot (Mittermeier, 2005) but there are many other sites across the region that are potentially important for the preservation of endemic species, regionally threatened species, habitats and assemblages (Miller & Morris, 1988, 2004; Hall *et al.*, 2008). These sites are potentially important not only for biodiversity conservation but also for the conservation of wilderness (Mittermeier *et al.*, 2003), the preservation of ecosystem services (Naidoo *et al.*, 2006) and ecological processes (Margules & Pressey, 2000) as well as the conservation of traditional cultural knowledge (Miller & Morris, 2004). The use of regionally applicable IPA criteria serves regional conservation goals far better than the global hotspots approach (Myers *et al.*, 2000; Kareiva & Marvier, 2003).

The IPA programme has been chosen for implementation by the APSG in order to identify regionally important sites for plant life, to highlight the importance of these areas for conservation at national, regional and global levels, and ultimately to provide a rationale and framework for their protection. The present paper will discuss the implementation of the IPA programme for the Arabian Peninsula countries of Saudi Arabia, Oman and Yemen, by examining the criteria used in selection, the development of the criteria within the regional context, the proposed programme of action and intended outputs.

Conservation Assessment and Planning

Conservation activity can be split into two stages: assessment and planning, and implementation (Margules & Pressey, 2000; Knight *et al.*, 2007). The IPA programme for the APSG region spans the gap that can emerge between these activities by including elements of both assessment and implementation (Knight *et al.*, 2008). The first stage in the IPA process is assessment, coupled with documentation. Using the criteria outlined above, each country in the APSG region is set to compile provisional lists of IPA sites. These sites will primarily be selected using the expert opinion of the APSG. This opinion is informed by existing biodiversity survey data and will operate under the guiding principle of complementarity (Vane-Wright *et al.*, 1991; Faith, 1994). After the initial identification process, the status of these sites should be confirmed by extensive field surveys. This is particularly important because the plant biodiversity of many potential IPAs in the APSG region is still poorly known. Although these surveys represent a significant investment, they are more cost effective than pursuing conservation action without the biodiversity data they will provide (Balmford & Gaston, 1999). Alongside investment in biodiversity surveys, a similar commitment is required in the development of adequate bio-informatics tools for storing and manipulating data (Wheeler, 2004; Neale *et al.*, 2007; Miller & Pullan, 2008). The results of the selection and surveying process will be transparent

and will be published as a series of short papers on the IPA network in the Arabian Peninsula. The first of these is the accompanying paper on Jabal Qaraqir in Saudi Arabia (Llewellyn *et al.*, 2010).

The criteria for IPAs in Saudi Arabia, Oman and Yemen are significantly different from those previously employed in Europe and southern Africa. The major changes are the abandonment of fixed thresholds on the number of sites which can be recognised as IPAs and the incorporation of subcriteria which recognise the importance of refugia for plant conservation. In part, these changes are in response to recent criticisms of KBAs. As mentioned above, Knight *et al.* (2007) criticise the KBA programme for being overly prescriptive, inflexible when dealing with issues of ecological connectivity and error prone through applying global criteria without input from local experts. They also claim it is neglectful of pragmatic implementation issues as it fails to involve conservation implementation agencies in the assessment process.

Knight *et al.* (2007) regard KBAs as overly prescriptive because they rely wholly on species as surrogates for biodiversity. One of the major strengths of the IPA approach is that, whilst it uses species, it also takes habitats into consideration in its assessment of irreplaceable sites for conservation. Whilst far more pragmatic than the KBA criteria, we view the site threshold element of the IPA criteria as being unnecessarily prescriptive. By not employing this threshold-based approach to site selection, the APSG IPA programme sites can be treated on a case-by-case basis. This increases flexibility and avoids a restrictive stance that may lead to the exclusion of important sites before the long-term conservation planning process has even begun.

The inclusion of refugia also takes account of the criticism of KBAs by moving from a predominantly static to a process-based view of conservation. Refugia are critical sites for the continuance of evolutionary lineages and evolutionary processes that shape biodiversity. In subcriterion B2 we question the value of maintaining individual sites in isolation and recommend that the selection of refugia needs to take into account issues of dispersability and connectivity. We suggest that this principle of maintaining networks of ecologically connected sites be incorporated within the other IPA criteria. This may lead to an increase in the number of selected sites and reinforces the argument against arbitrary thresholds.

After assessment and documentation, the second part of the IPA programme is implementation. Important Plant Area site selection is itself oriented towards conservation planning. This is manifest in the increased pragmatism in the criteria for the Arabian Peninsula countries. A guiding principle of the programme is that selected sites should be of an appropriate size for management purposes and that site selection should also recognise ecological processes and global changes such as climate change (Hannah *et al.*, 2007). Another principle is that sites should be selected in view of a landscape-scale management model, with the overriding aim of persistence (Cowling, 1999; Knight *et al.*, 2007). This acknowledgement of ecological process and persistence will lead towards more effective conservation implementation in a time of changing global climate (Dawson, 2007; Knight *et al.*, 2007).

An orientation towards implementation is facilitated by the composition of the APSG, which is made up of local biodiversity experts and global biodiversity experts as well as individuals from some of the major implementation agencies in the region, for example national bodies such as the National Commission for Wildlife Conservation and Development (NCWCD) from Saudi Arabia. The IPA programme in the Arabian Peninsula will therefore operate synergistically with conservation planning initiatives in the region. An example of this is collaborative work being undertaken with NCWCD towards the establishment of a protected area network in Saudi Arabia. In this partnership the role of the IPA programme is, in effect, to enhance the knowledge of a site's biodiversity and to provide a structured rationale for its conservation. Once provisional lists of IPAs are agreed by the APSG countries, the next step of the programme is to raise awareness of these sites through publications and workshops. It is recognised that not every ideal site will become a protected area. Although the goal is to strengthen the protection of every IPA through raising awareness and increasing our understanding of sites, the important issues of land availability, implementation costs and other socio-economic factors will also be taken into account (Wilson *et al.*, 2006). The collection of such data will require a significant research programme in itself. As well as socio-economic research, the IPA programme will also be committed to expanding botanical research, particularly the collection of basic plant distribution data and storage of this data in floristic databases (Hall & Miller, in press).

This acknowledgement of real-world conservation issues in the IPA programme is exemplified by the inclusion of existing, traditionally protected areas (known as *himas* in Saudi Arabia and Yemen and *hamiyah* in Oman) within an IPA network. In Saudi Arabia, a *hima* is a site 'where trees and grazing lands are protected from indiscriminate harvest on a temporary or permanent basis' (Gari, 2006). These traditional protected sites pre-date Islam and were established as a means of protecting grazing resources during times of drought (Llewellyn, 2003). There are a variety of traditional resource restrictions associated with *himas*, but restrictions often include either a total or seasonal prohibition of grazing and/or cutting trees (Gari, 2006). Islam promoted the establishment of *hima* as resources for the well-being of the community and, as a result, these locally protected areas were widespread throughout the Arabian region (Llewellyn, 2003; Gari, 2006). In Saudi Arabia alone an estimated three thousand *himas* were functioning in the mid-20th century (Eben-Saleh, 1998). However, for political and socio-economic reasons, the *hima* system is currently in decline across much of Arabia (Gari, 2006).

Despite the reduction in the numbers over the last 50 years, there are still a significant number of these locally protected areas which have 'tremendous value for achieving the objectives of the conservation of biodiversity' (Abuzinada, 2003). One such *hima* can be found on Jabal Ral in the Tabuk region of Saudi Arabia. The Bili tribe have managed this site on the eastern edge of the Tihamah plain as a protectorate for the mountains' ibex population through regulating hunting and livestock grazing (O. Llewellyn, pers. obs.). Whilst benefiting the ibex, preliminary surveys have revealed that this has also protected the mountain vegetation from the effects of overgrazing

(O. Llewellyn, pers. obs.). Whilst more extensive research is required on the contemporary extent and functioning of the *hima* system it is clear that incorporating such areas within a protected area network has great potential. Including *himas* within the APSG IPA programme (and strengthening their functioning where necessary) is a cost-effective way of planning a protected area network. This strategy also represents a way of involving local stakeholders in conservation implementation and a means for providing conservation education to local people – factors which are critical if conservation assessment and planning is to be successful (Margules & Pressey, 2000).

Arabian Peninsula IPA Programme Criteria

These criteria were developed for a European context by Plantlife International and were first published in 2002 (Anderson, 2002). Three broad criteria exist:

Criterion A – The site holds significant populations of one or more species that are of global or regional conservation concern.

Criterion B – The site has an exceptionally rich flora in a regional context in relation to its biogeographic zone.

Criterion C – The site is an outstanding example of a habitat or vegetation type of global or regional plant conservation and botanical importance.

These criteria can be broadly classified as dealing with A – threatened species, B – exceptional species richness, and C – threatened habitats. To qualify as an IPA, at least one of these three criteria must be applicable to a site. Since being developed for Europe, the IPA criteria have been adopted and adapted by regional initiatives to take into account differences in both regional biodiversity and data quality. In southern Africa, the subcriteria have been refined for the region by the Southern African Botanical Diversity Network (SABONET, 2004). During a meeting of the APSG in 2005 a similar refinement of the criteria was instigated for the Arabian region. The adopted criteria for the IPA programme in Saudi Arabia, Oman and Yemen are discussed below.

Criterion A

A1: Site contains globally threatened species or infraspecific taxa (i.e. subspecies and varieties).

A2: Site contains regionally (Arabian) threatened species or infraspecific taxa.

A3: Site contains nationally threatened species or infraspecific taxa.

A4: Site contains national endemic, near endemic, regional endemic and/or regional range-restricted species or infraspecific taxa.

A5: Site contains species of special interest (see below).

Selection

The IPA network should include all sites necessary to ensure the long-term viability of a species or infraspecific taxon. The selected sites must contain viable populations of a chosen species or populations that could be restored to viability.

Issues

The guiding principle for IPA selection in Arabia under criterion A is that the site holds significant populations of one or more species or infraspecific taxa that are of global, regional or national conservation concern. The inclusion of infraspecific taxa follows the approach of SABONET in southern Africa (SABONET, 2004). We regard both subspecies and varieties as important evolutionary units which contribute to the diversity of the regional flora.

In contrast to existing IPA criteria for Europe and southern Africa, selection of IPAs in the Arabian Peninsula will not involve the setting of prescribed thresholds. Adopting thresholds at the assessment stage of conservation is regarded as overly restrictive. Not only can thresholds lead to the arbitrary ranking of sites, but a rigid application of thresholds can also exclude areas from the conservation process, areas which might be more easily conserved using fewer resources (e.g. traditionally managed sites). Removing thresholds from IPA selection is therefore viewed as a more flexible and pragmatic approach (as discussed above).

For the IPA programmes in Saudi Arabia, Oman and Yemen the following definitions will be applied to criterion A. National endemics are those taxa which are restricted to individual countries. Near endemic taxa are endemic to a geographical unit which crosses political boundaries, for example the wet woodland of Dhofar/Hawf. A regionally endemic taxon is one which is only found in the countries of the Arabian Peninsula. Regional range-restricted taxa are endemic to a certain biogeographical area, for example Afromontane endemic, which extends beyond the Arabian Peninsula.

Subcriterion A5 has been added to the Arabian criteria, and relates to species of special interest. Such taxa include:

- species representing distinct evolutionary lineages (e.g. single species plant families such as *Barbeya oleoides* – Barbeyaceae)
- species of national heritage significance
- important genetic resources
- keystone species.

To select IPAs using criterion A it is critical that APSG countries publish IUCN Red Lists for the region, for both globally and regionally threatened species. The Red List of Oman will be the first for the Arabian Peninsula countries, and could provide a template for the Arabian Red List. In particular, distribution maps are necessary for discerning the range of potentially threatened taxa and species of special interest. These distribution maps can be used to calculate both area of occupancy and extent of occurrence under IUCN Red List criterion B (IUCN, 2001). If these distribution

data are collated using GIS and analysed using a complementarity algorithm they can provide a valuable indicator of priority sites for IPA selection and conservation action (Balmford & Gaston, 1999).

Criterion B

B1: The site is a particularly species-rich example of a defined habitat type in Arabia.

B2: The site is a refuge for:

(a) elements of one biogeographic zone that fall within another (an important aspect of the biogeography of the Arabian Peninsula);

(b) biogeographically and bioclimatically restricted plants to 'retreat to' in the face of global climatic change.

Selection

Topographic diversity can be used as a guide to refugia from climatic change. Selection of refugia needs to target a network of sites which will allow plant dispersal and gene flow between sites. Ecological connectivity increases the likelihood of persistence in the face of climatic change (Rouget *et al.*, 2003). There are no set thresholds for refugia selection, but priority must be given to topographically diverse sites with a high number of vegetation types.

Issues

The guiding principle for IPA selection under criterion B is botanical richness. Following the SABONET interpretation of criterion B (by including species of special interest) was considered, but such species (i.e. endemic species, nationally important resources) have been included under criterion A (SABONET, 2004).

A significant issue with the implementation of this criterion is the need to provide a definition of a *plant habitat* and a classification of each habitat type in the APSG region. There is a substantial body of research on plant habitats in the Arabian region (Al-Hubaishi & Müller-Hohenstein, 1984; Scholte *et al.*, 1991; Ghazanfar & Fisher, 1998; Scholte, 2000), but for consistency in IPA selection, existing classifications and descriptions need to be standardised.

For the Arabian Peninsula IPA programme, criterion B has been modified to explicitly include those sites which act as plant refugia. In arid environments, these areas allow the persistence of species during periods of hyper-aridity (Miller & Morris, 2004). With future predictions of increased aridity in the Arabian region, all potential refugia are critically important for plant conservation (Dawson, 2007). Therefore, no restrictive thresholds have been set for the selection of these areas. In order to facilitate the selection of refugia, it is important to publish provisional lists of potential refugia along with topographic classifications and descriptions.

Criterion C

The site is identified as an outstanding example of a globally or regionally (Arabian) threatened habitat type.

Selection

All sites should be selected to ensure the long-term viability of a threatened habitat type. The chosen sites must, therefore, contain viable habitats or habitats that could be restored to viability.

Issues

The guiding principle for IPA inclusion under criterion C is the preservation of threatened habitats. The current criteria follow SABONET by rejecting the need for a priority list of threatened habitats as per the European Habitats Directive.

This is potentially a very important criterion for IPA selection in the region. Its implementation requires both the standardisation of habitat classifications and the listing of threatened habitats in the Arabian region. Compilation of this list will require extensive field surveys of potentially threatened habitats as well as research into the drivers of plant habitat degradation.

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