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Note: Detailed location data of indigenous orchid and endangered species sightings presented at the Conference have been removed from the papers in these Proceedings as a precautionary measure. Should you require access to this information please contact the respective speakers.

Citizen Scientists surveying South Africa's Orchids of conservation concern

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Introduction

The Custodians of Rare and Endangered Wildflowers [CREW] programme is a novel citizen science initiative that involves members of the South African public from different socio-economic backgrounds in the monitoring and conservation of plant species of conservation concern. Founded in 2003, CREW is a collaboration between the South African National Biodiversity Institute (SANBI) and the Botanical Society of South Africa (BotSoc). The Cape Floristic region is supported by the Mapula Trust. The programme bridges the gap between science and society by providing the space for botanists, Red List scientists, conservation agencies, the public and landowners to help conserve South Africa's most threatened plants.

South Africa's Plant Conservation Strategy

The national plant conservation strategy was developed under the leadership of SANBI, the focal point for the implementation of the Global Strategy for Plant Conservation nationally with support from the Botanical Society of South Africa (BotSoc). Through the development of this strategy a network of botanists has been developed that includes conservation agencies, non-governmental organisations (NGOs) and academic institutions. It is this strong network will ensure that South Africa's Strategy for Plant Conservation is implemented by 2020.

Plant conservation is not done in isolation of other work to conserve biodiversity. South Africa's biodiversity sector bases its work on priorities identified through systematic biodiversity plans that identify Critical Biodiversity Areas, which represent ecologically viable networks of ecosystems and species for conservation.

The strategy contains 16 outcome-oriented targets, each of which, if implemented well, will help lead to improved conservation of plants. These targets are encapsulated within 5 objectives:

- **Objective 1:** Plant diversity is well understood, documented and recognised. Targets within this objective include the e-Flora project, Red Listing work and working towards digitising herbaria across the country
- **Objective 2:** Plant diversity is urgently and effectively conserved. At an ecosystem level, the targets focus on conserving plant species in production lands and protected area expansions. Plant diversity conserved at a species level emphasises both ex-situ and in-situ conservation, conserving crop wild relatives and effectively managing biological invasions.
- **Objective 3:** Plant diversity is used in a sustainable and equitable manner with emphasis on CITES listed species as well as harnessing indigenous knowledge.
- **Objective 4:** Education and awareness about plant diversity, its role in sustainable livelihoods and importance to all life on earth is promoted
- **Objective 5:** The capacity and public engagement necessary to implement the strategy.

For more information about South African Red List for plants, see http://biodiversityadvisor.sanbi.org/planning-and-assessment/plant-conservation-strategy/

CREW Human Capital Development Project

In meeting Objectives 4 and 5 of the Plant Conservation Strategy, the CREW programme focuses on Human Capital Development by interacting with higher education institutions across South Africa. The lecture presented annually to 2nd or 3rd year lecture to students illustrates the work currently underway in the plant conservation sector and job opportunities.

At some institutes, we conduct a fieldtrip either to monitor a threatened species or to learn Plant Family characteristics. We have found that students who attend these sessions have a greater likelihood of working at SANBI as interns or research assistants.

CREW undertakes to mentor interns annually to develop individuals with the necessary skills required in the plant conservation sector. Furthermore, the CREW Eastern Cape node has undertaken to up skill provincial reserves' rangers by providing plant collection, pressing and identification skills.

tion concern - listed as Near Threatened, Data Deficient or Rare range restricted endemics on South Africa's National Red List. This means that 1 out of every 3 of South Africa's plant species is threatened.

Why CREW is needed?

South Africa has 6% of the world's plant species and is the only country that has its own plant kingdom and three of the world's Biodiversity Hotspots. It's the first megadiverse country to fully assess the risk of extinction of its entire flora (ca. 20 700 plant species). About 12% of plant species are threatened with extinction and a further 18% are of conserva-

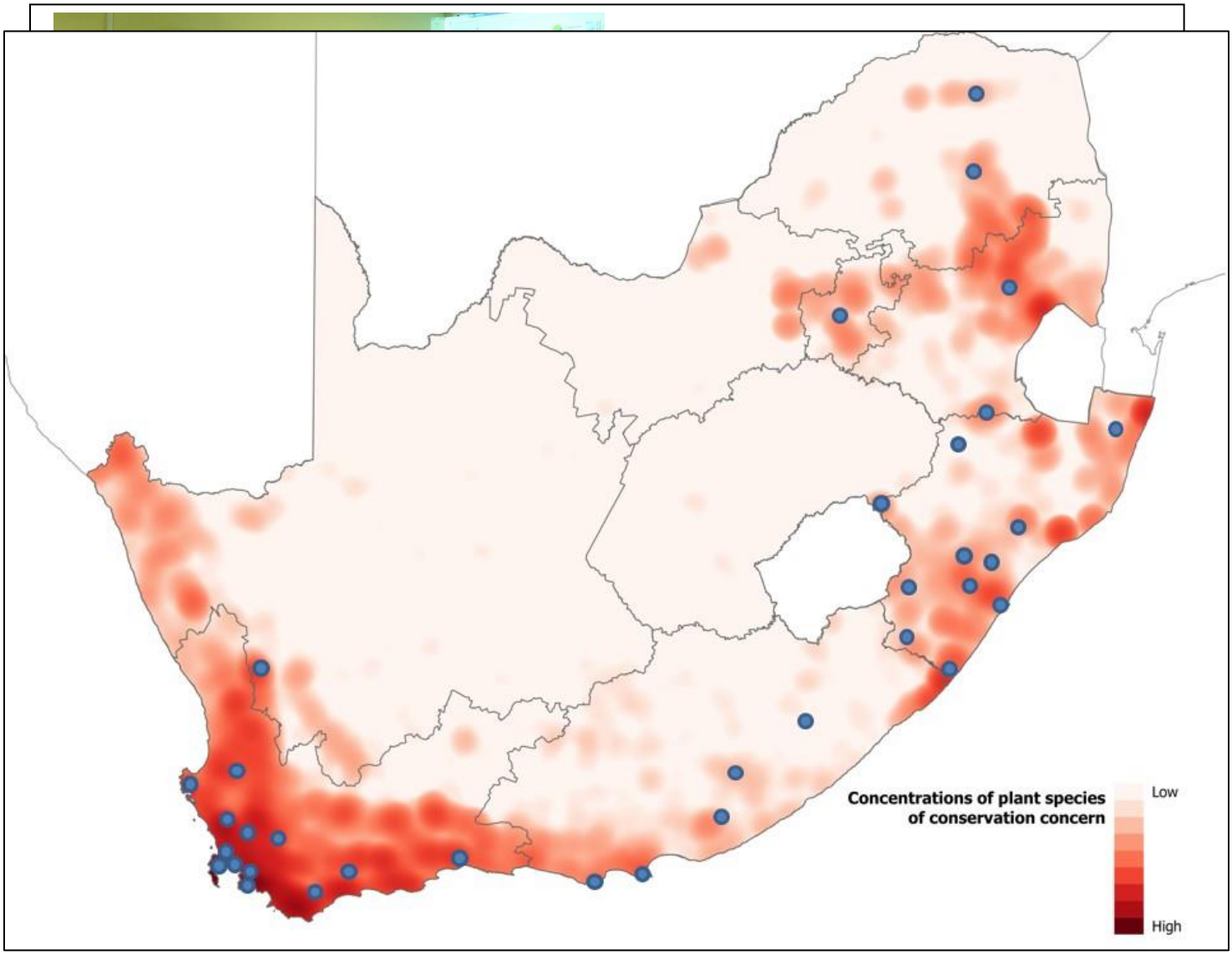
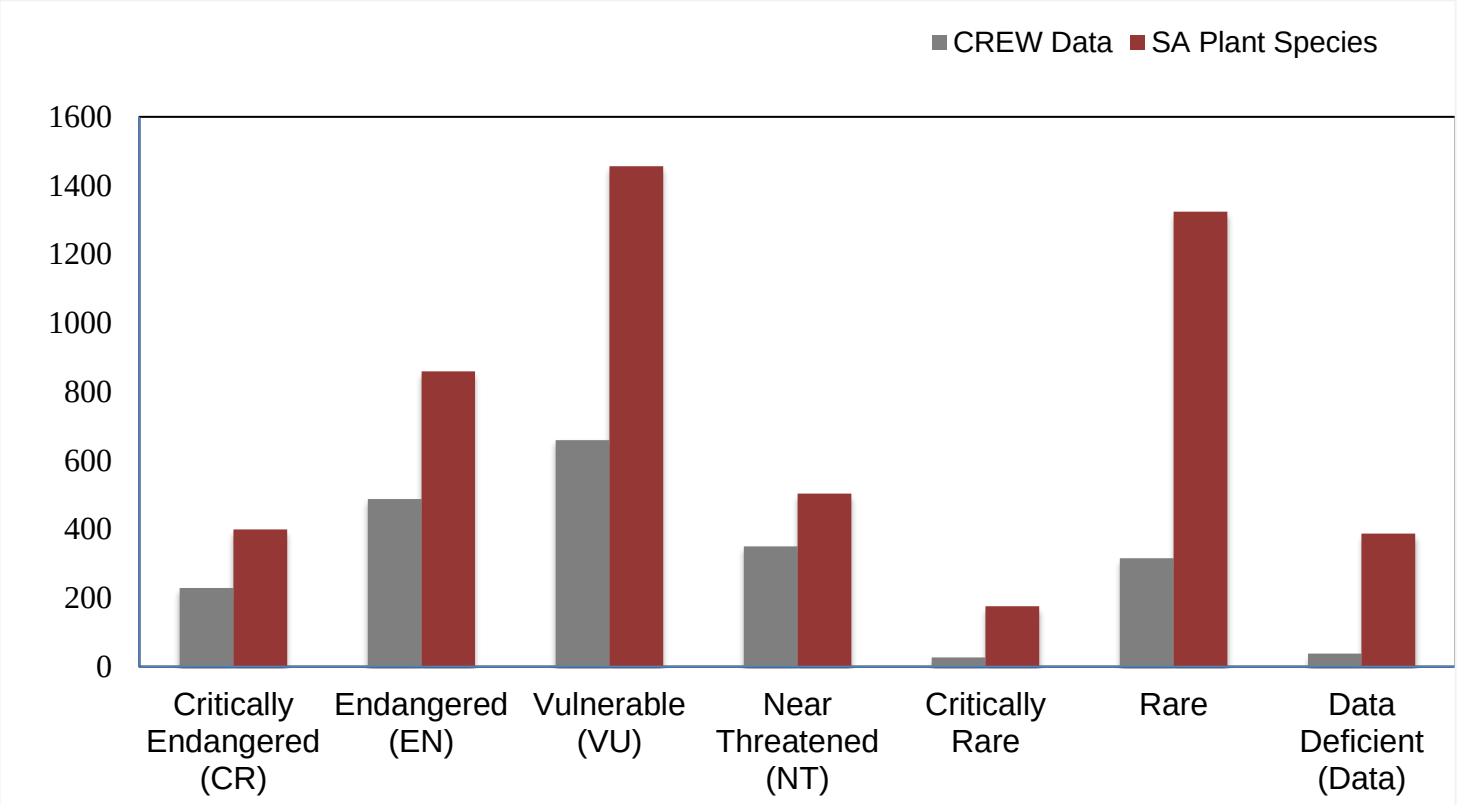


Figure 1: Map showing CREW citizen science group's locality in relation to areas of high concentration of plant species of conservation concern across South Africa

For most of these species, there is no recent information about how the populations are doing in the wild. South Africa is required to keep track of plant species to be able to report nationally and internationally on the state of plant diversity and its conservation thereof, via the IUCN Red List.

these remarkable individuals provide to the programme is instrumental for the identification of areas in need of conservation. With government conservation agencies experiencing ongoing loss of capacity and funding, the contribution of CREW citizen scientists to the conservation of South Africa's flora is invaluable.



CREW's operation

The CREW programme operates throughout the country, in areas with high concentration of plants of conservation concern. Being regionally-based, with 3

Figure 2: South African plant species of specific Red List category versus species CREW has surveyed

nodes - Cape Floristic Region, Summer Rainfall Region and the Eastern Cape Region that provides support to the citizen scientist groups by providing resources and identification courses as well as linking the groups to their local conservation agencies.

The almost 3000 CREW citizen scientists are vital for the functioning of this national body. The help that

CREW's data journey begins with obtaining the provincial Red List, detailing the plant species of conservation concern and their localities. Annually, the CREW nodes prioritise the species to be surveyed with individual citizen science groups. Fieldtrips undertaken either focus on sites or target species (depending on the priority species flowering time) and specific data is collected. Data captured within the CREW database is shared with SANBI's Red List scientists. Species literature, CREW data as well as data obtained

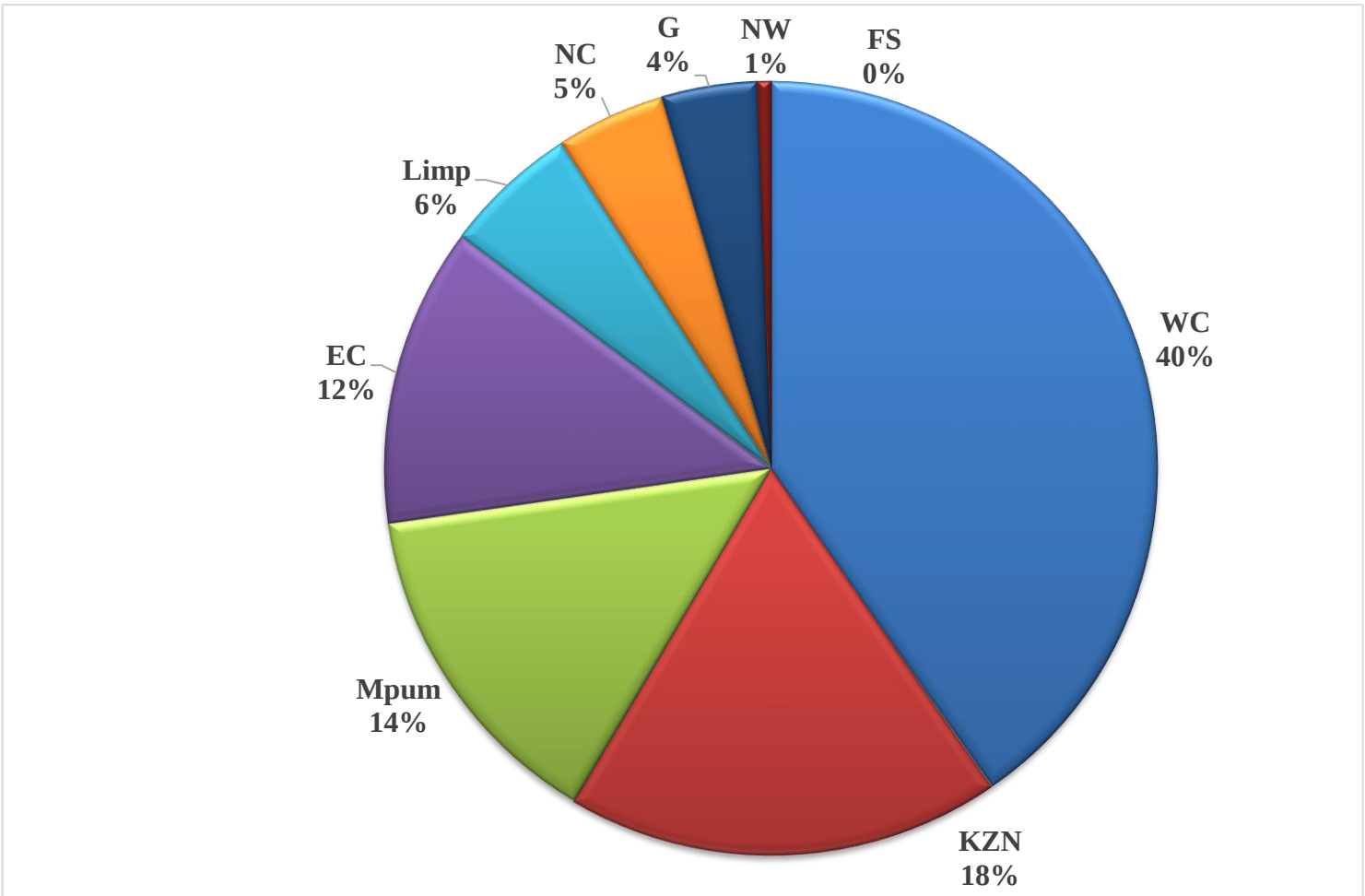
from several individuals, and herbarium specimen information is consulted to assess the plant species risk of extinction. Occurrence records for threatened plants inform land use decision making and protected area expansion prioritization at the different tiers of government on an on-going basis.

What has CREW achieved?

Although CREW is in its 15th year of operation, the programme focused in the Cape floristic region for 5 years before expanding to KZN, and very recently in the Eastern Cape. From the graph in figure 2, it can be inferred that the CREW programme has prioritized surveying species listed in the threat categories - Critically Endangered, Endangered, and Vulnerable.

Emphasis was also placed on species listed as Near Threatened as available evidence for these species indicate that it nearly meets any of the IUCN criteria for Vulnerable, and may likely become at risk of extinction in the near future.

Species are listed as Data Deficient when there is insufficient information to make an assessment of its risk of extinction, but the species is well described. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate; thus CREW prioritising these species.



A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. Similarly, a species listed as Critically Rare holds the same criteria as Rare in addition to being known to occur at a single site. CREW citizen scientists documents these species to validate

that the conditions have remained unchanged, otherwise a reassessment is required. For more information about South African Red List for plants, see http://redlist.sanbi.org/

Figure 3: Pie chart illustrating the distribution of Orchid species of conservation concern across South Africa's 9 provinces

Orchids South Africa

The family Orchidaceae is the 3rd largest plant family, after Asteraceae and Fabaceae. South Africa is home to 483 Orchid species, of which 128 are of conservation concern. The genus *Disa* has the highest number of species threatened by extinction.

Examples of orchids of conservation concern per province

Orchid species of conservation concern, known to occur in 8 of 9 (Free State does not have any) of South Africa's provinces, are highlighted in this section.

Northern Cape: *Disa karooica* (Vulnerable)

This species is known from 5 localities in the Kamiesberg and Roggeveld. In 2014 CREW discovered a new population close to Springbok which was a massive range extension for the species. The major threat to this species is grazing.

Western Cape: *Disa procera* (Endangered)

Previously known from 1 locality; until 2013 when CREW found a new population. This data (and the possibility of more populations existing) allowed for the species status to change from from Critically Endangered to Endangered.

Eastern Cape: *Satyrium hallackii* subsp. *hallackii* (Endangered)

Confined to coastal flats, this species is known from 3 sites. Long-term surveys has confirmed that the Western Cape populations are now extinct. The Red List scientists suspect that there has be a 50% habitat loss over the past 15 years. The species is severely threatened by urban expansion and encroachment from invasive alien vegetation.

KwaZulu-Natal: *Zeuxine africana* (Endangered)

Having established as a result of immigration from another subpopulation outside South Africa, this species is known from 1 site with fewer than 50 mature individuals. CREW has found it once in the 4 years of surveying between 2013 and 2016. Based on regional criteria, the Red List scientists have downgraded this species from Critically Endangered to Endangered status.

Gauteng: *Holothrix randii* (Near Threatened)

This species is known from 12 localities with a total population estimated to be between 4000-6000 individuals. Remarkably, CREW has in 2016, found a new site with approximately 200 individuals. The species still encounters a continuing decline due to habitat loss within Gauteng.

Mpumalanga: *Disa staerkeriana* (Critically Endangered)

Discovered in 2013 by H. Staerker, this rare, range-restricted species is only known from a single population of 30 mature individuals. This species' habitat is an important mountain catchment area as well as a hotspot of endemism for orchids. As a result it is being actively managed as a protected area by the province's conservation agency. Fortunately, there are no immediate threats to this species.

North West: *Habenaria culveri* (Rare)

H. culveri is known only from 4 highly disjunct localities growing in deep shade in subtropical forest. The specimen collected in Rustenburg in 1953 is probably a misidentification as there is no suitable forest habitat around Rustenburg. This species has no recorded threats.

Limpopo: *Oberonia disticha* (Critically Endangered)
This species is historically known from 3 locations. It is now confined to a small area in Limpopo Province. Searches in 2005 and 2007 have failed to locate individuals. The inaccessibility of localities to survey this species prevents it from being assessed properly.

Joining the CREW Citizen Science network
There are many other ways on which you can assist the CREW Programme in making it a success; it could be raising awareness on plants with the aim of changing mind-set for different landowners and users or through educational initiatives in your area.

The CREW network comprises of learners, university students, working professionals and retired individuals. Although there is no formal botanical training required joining the CREW programme; we do encourage citizen scientists to focus on building their own knowledge of plant species.

How can citizen scientists contribute?

- Submit data to CREW - share species lists, complete CREW data forms.
- Form a CREW group with friends, communities, students to survey priority areas for plant conservation.
- Get involved in actively managing key site for threatened plant conservation.
- Submit observations on iNaturalist www.inaturalist.org
- Support your local CREW node office with administration tasks like mounting specimens, checking data quality, etc.

Conclusion
The CREW programme in its 15th year of operation has made tremendous progress in surveying South Africa's plant species of conservation concern. The numerous successful finds as well as null records being documented has enabled these species to be reassessed accordingly. The success of the CREW programme is directly linked to the passionate people who volunteer their time and resources to assist in national conservation efforts.