Evaluating Threats and Conservation Status of South African *Rhynchosia*

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ABSTRACT

Genus *Rhynchosia* is a genus of high economic value in South Africa. It also has high species diversity in South Africa. This study determined the conservation status of species in this genus and the threats these species are facing. The SANBI (South African National Biodiversity Institute) Red List was employed for this purpose. The results of this study revealed that *Rhynchosia* is not a threatened genus, but some few threatened species were identified in this study and ecological factors threatening them were also identified. The main threats identified in this study are human induced threats. All the threatened species are endemic species and endemic species are to be prioritized for conservation. It is therefore recommended that studies on propagation of the threatened species that are all endemic in this genus should be carried out and more protection of these species should be encouraged. Controlling the human induced threats identified in this study should also be encouraged.

(Keywords: conservation, endemism, ethnobotanical uses, extinction risks, threats, biodiversity)

INTRODUCTION

The genus *Rhynchosia* belongs to Fabaceae family (Manyelo, 2014). Many species of this genus are found in Africa with majority of them represented in South Africa (Thulisile, 2017). It is a genus of high economic importance that is providing high ecosystem services to man and its environment.

Many species of this genus are known for their medicinal uses. Some serve as anticancer agents (Xjia, et al., 2015; Bethu, et al., 2018) and anthelminthic agents (Mali and Mahale, 2008). Some species in this genus are used as immune boosters in man (Jia, et al., 2018) while some serve as antimicrobial agents (Bhaksu and Raju, 2009). Some species of this genus are also used as antioxidant and anti-inflammatory agents (Kim, 2016; Park and Kim, 2017). Additionally, some are used for wound healing (Bangalore and Agrahari, 2009) and others are used for treating rheumatism, dysentery, and skin infection (Challa, et al., 2011).

Studies have revealed that certain plant genera that are heavily exploited for medicinal purposes are vulnerable to extinction (Williams, et al., 2013; Bamigboye, et al., 2017, 2018; Bamigboye, 2020). It is therefore conservation wise to consistently evaluate genus heavily exploited for medicinal purposes for conservation. This makes this study important because *Rhynchosia* species are popularly known for their medicinal uses.

Although species in *Rhynchosia* are primarily known for their medicinal uses, they still have other uses. They are used as beverages (Zulu, et al. 1997; Kim, et al., 2016). Some are also used as bio-herbicieds, (El-Gawad, et al., 2018). Species in this genus are used for feeding cattle (Shukla, et al., 1970). They have also been used as agents of contraception because of their anti-spermicidal effects (Guan, et al., 2014) and they also act as antifertility agents in pet animals (Mustapha, et al., 2011).

There is a need to evaluate this genus of high economic value for conservation in South Africa to know the exact number that are threatened and the factors responsible for their threats. This study evaluated the threats and conservation status of each species of this genus and also the overall genus using the SANBI Red List.

METHODOLOGY

The South African National Biodiversity Institute (SANBI) is the institute that is responsible for conservation assessment of plant and animal taxa in South Africa and the institute follows

IUCN (International Union of Conservation of Nature) guidelines for assessment of species conservation status. In this study SANBI Red List was employed to evaluate the threats and conservation status of South African *Rhynchosia*.

The conservation status, endemism status, and the threats each species of this genus is facing in South Africa were obtained from the Red List. Percentages of species that are threatened (Critically Endangered, Endangered, Vulnerable) were calculated and the percentages of species that are of conservation concern (Critically Endangered, Endangered, Vulnerable, Near Threatened, Rare, and Data Deficient) were calculated. Percentage of species of this genus that are facing different kind of threats were calculated.

RESULTS AND DISCUSSION

Conservation Status of South African *Rhynchosia*

A total of 65 taxa in genus *Rhynchosia* appeared on SANBI Red List.1.6% are endangered, 4.6% of the species are vulnerable, 6.3% are data deficient taxonomically problematic, 3.1% data deficient insufficient information, 4.6% are not evaluated, and 79.6% are listed as least concern. Only 6.2% of the species in this genus are threatened (Endangered + Vulnerable) while 15.6% are of conservation concern (Endangered + Vulnerable + Data deficient taxonomically problematic + Data deficient insufficient information). This study revealed that many species of this genus are not threatened. But there are still few threatened species and species of conservation concern in this genus.

Threats to South African *Rynchosia*

Results of the percentages of species facing different kind of threats on SANBI Red List are as follows. 7.8% are threatened due to habitat destruction, 3% threatened due to overgrazing, 1.5% threatened by occurrence of invasive species. The increase in the trend of species extinction is quickly eroding the gains of global biodiversity (Mace, et al., 2008) and this trend has been projected to multiply except for serious intervention in the coming decades (Tali, et al., 2015). There are high disruptions in ecosystem services due to biodiversity loss (Biggs, et al., 2008). Factors such as climate change, invasive species, unsustainable harvesting, and habitat destruction are still tending towards the increasing patterns resulting into increase in extinction risk in flora and fauna taxa. Threats identified in this study (Table 1) should be controlled to prevent increase in extinction risk of the species that are being confronted by these threats.

Threats to Endemic Species of South African *Rhynchosia*

Endemic species are important because they exist within certain geographic regions alone (Bamigboye, 2019). The decline of their population results in significant biodiversity loss (Moraswi, et al., 2019). Conservation and protection of endemic species should be given high priority globally. There are 30 Endemic species in genus *Rhynchosia* and 6 of them are facing threats due to overgrazing and habitat destruction as a result of agricultural practices (Table 1).

The continuity of the ecological forces posing threat to these species will further increase the extinction risk of these species. It is therefore very important that these human induced threats to the endemic species of this genus be controlled.

CONCLUSION

One of the steps to unravel threats and conserve plant that are of high ethnobotanical uses is to determine the extent of utilization of these species to meets several human needs and also determine how the populations of these species are being negatively impacted by this uses (Bamigboye, et al., 2017; Bamigboye and Tshisikhawe, 2020). This makes ethnobotanical studies and studies of population size, structure and density of plant species of great importance especially the threatened species and the endemic species. An example of such a study was carried out on one of the threatened species identified in this study by Ramarumo and Maroyi (2020). They discovered that *Rhynchosia vendae* (one of the threatened endemic species identified in this study) only have 123 individuals left within a certain geographic location where they are collected for medicinal purposes (Rasethe, et al., 2019).

Table 1: Species of Genus *Rhynchosia* in South Africa, their Conservation Status, Endemism status, and Threats on SANBI Red List.

Species	Conservation Status	Endemism Status	Threats
Rhynchosia adenodes Eckl. & Zeyh.	Least Concern	Not Endemic	No threat
Rhynchosia albissima Gand.	Least Concern	Not Endemic	No threat
Rhynchosia angulosa Schinz	Least Concern	Not Endemic	No threat
Rhynchosia angustifolia (Jacq.) DC.	Least Concern	Endemic	No threat
Rhynchosia argentea (Thunb.) Harv.	Least Concern	Endemic	No threat
Rhynchosia arida C.H.Stirt.	Vulnerable	Endemic	Habitat destruction due to cultivation, Overgrazing
Rhynchosia atropurpurea Germish.	Least Concern	Endemic	No threat
Rhynchosia bullata Benth. ex Harv.	Least Concern	Endemic	No threat
Rhynchosia calvescens Meikle	Least Concern	Endemic	No threat
Rhynchosia capensis (Burm.f.) Schinz	Least Concern	Endemic	No threat
Rhynchosia caribaea (Jacq.) DC.	Least Concern	Not Endemic	No threat
Rhynchosia chrysantha Schltr. ex Zahlbr.	Data deficient taxonomically problematic	Endemic	No threat
Rhynchosia chrysoscias Benth. ex Harv.	Least Concern	Endemic	No threat
Rhynchosia ciliata (Thunb.) Schinz	Least Concern	Endemic	No threat
Rhynchosia clivorum S.Moore subsp. clivorum	Least Concern	Not Endemic	No threat
Rhynchosia clivorum S.Moore subsp. pycnantha (Harms) Verdc.	Least Concern	Not Endemic	No threat
Rhynchosia coddish Germish.	Least Concern	Endemic	Habitat destruction due to urban development and cultivation of crops
Rhynchosia connata Baker f.	Data Defficient insufficient information	Endemic	Habitat destruction by subsistence Agriculture
Rhynchosia cooperi (Harv. ex Baker f.) Burtt Davy	Least Concern	Not Endemic	No threat
Rhynchosia crassifolia Benth. ex Harv.	Least Concern	Not Endemic	No threat
Rhynchosia densiflora (Roth) DC. subsp. chrysadenia (Taub.) Verdc.	Least Concern	Not Endemic	No threat
Rhynchosia emarginata Germish.	Endangered	Endemic	Overgrazing
Rhynchosia ferulifolia Benth. ex Harv.	Least Concern	Endemic	No threat
Rhynchosia fleckii Schinz	Least Concern	Not Endemic	No threat
Rhynchosia foliosa Markötter	Data deficient insufficient information	Endemic	No threat
Rhynchosia galpinii Baker f.	Data deficient taxonomically problematic	Endemic	Habitat destruction, invasive presence
Rhynchosia genistoides Burtt Davy	Data deficient taxonomically problematic	Not Endemic	No threat
Rhynchosia grandifolia Steud.	Least Concern	Endemic	No threat
Rhynchosia harmsiana Schltr. ex Zahlbr. var. burchellii Burtt Davy	Least Concern	Not Endemic	No threat
Rhynchosia harmsiana Schltr. ex Zahlbr. var. harmsiana	Least Concern	Not Endemic	No threat

Species	Conservation Status	Endemism Status	Threats
Rhynchosia harveyi Eckl. & Zeyh.	Least Concern	Endemic	No threat
Rhynchosia hirsuta Eckl. & Zeyh.	Least Concern	Not Endemic	No threat
Rhynchosia hirta (Andrews) Meikle & Verdc.	Least Concern	Not Endemic	No threat
Rhynchosia holosericea Schinz	Least Concern	Not Endemic	No threat
Rhynchosia komatiensis Harms	Least Concern	Not Endemic	No threat
Rhynchosia leucoscias Benth. ex Harv.	Least Concern	Endemic	No threat
Rhynchosia microscias Benth. ex Harv.	Least Concern	Endemic	No threat
Rhynchosia minima (L.) DC.	Least Cocern	Not Endemic	No threat
Rhynchosia minima (L.) DC. var. falcata (E.Mey.) Verdc.	No Evaluated	Non	No threat
Rhynchosia minima (L.) DC. var. minima	Not Evaluated	Non	No threat
Rhynchosia minima (L.) DC. var. prostrata (Harv.) Meikle	Not Evaluated	Non	No threat
Rhynchosia monophylla Schltr.	Least Concern	Not Endemic	No threat
Rhynchosia nervosa Benth. ex Harv.	Least Concern	Not Endemic	No threat
Rhynchosia nitens Benth. ex Harv.	Least Concern	Not Endemic	No threat
Rhynchosia ovata J.M.Wood & M.S.Evans	Least Concern	Endemic	No threat
Rhynchosia pauciflora Bolus	Least Concern	Non Endemic	No threat
Rhynchosia peglerae Baker f.	Data deficient taxonomically proplbematic	Endemic	No threat
Rhynchosia pentheri Schltr. ex Zahlbr. var. hutchinsoniana Burtt Davy	Least Concern	Not Endemic	No threat
Rhynchosia pentheri Schltr. ex Zahlbr. var. pentheri	Least Concern	Not Endemic	No threat
Rhynchosia phaseoloides (Sw.) Kuntze	Not Evaluated	Non	No threat
Rhynchosia pinnata Harv.	Least Concern	Endemic	No threat
Rhynchosia reptabunda N.E.Br.	Least Concern	Not Endemic	No threat
Rhynchosia resinosa (Hochst. ex A.Rich.) Baker	Least Concern	Not Endemic	No threat
Rhynchosia rogersii Schinz	Vulnerable	Endemic	Invasive species occurrences, habitat destruction
Rhynchosia schlechteri Baker f.	Least Concern	Endemic	No threat
Rhynchosia sordida (E.Mey.) Schinz	Least Concern	Not Endemic	No threat
Rhynchosia spectabilis Schinz	Least Concern	Endemic	No threat
Rhynchosia stenodon Baker f.	Least Concern	Endemic	No threat
Rhynchosia sublobata (Schumach.) Meikle	Least Concern	Not Endemic	No threat
Rhynchosia thorncroftii (Baker f.) Burtt Davy	Least Concern	Not Endemic	No threat
Rhynchosia totta (Thunb.) DC. var. fenchelii Schinz	Least Concern	Not Endemic	No threat
Rhynchosia vendae C.H.Stirt.	Vulnerable	Endemic	Habitat destruction due to agricultural practices
Rhynchosia villosa (Meisn.) Druce	Least Concern	Endemic	No threat
Rhynchosia viscidula Steud.	Data Defficient taxonomically problematic	Endemic	No threat
Rhynchosia woodii Schinz	Least Concern	Not Endemic	No threat

Continuous exploitation of this plant species in this area might result into extirpation of the whole population of this species because it is endemic to this area. Studies like this for all endemic species of *Rhyncnosia* is recommended to evaluate the population size and density and determine ethnobotanical uses that might pose threats to these species. This will assist in coming up with conservation measures that will promote the sustainability of these species and reduce their risk of extinction.

In this study only the endemic species are threatened (Table 1) and this signal why it is important to protect endemic species. It is therefore recommended that all the endemic species should be further assessed for conservation purpose to determine the ones that might have become threatened and determine how their extinction risk can be reduced.

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