

Rediscovery of the threatened Stoffberg Widow butterfly, *Dingana fraterna*: The value of citizen scientists for African conservation

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Abstract

The Stoffberg Widow, *Dingana fraterna* (Lepidoptera: Satyrinae), was only known from a single highly localised population near Stoffberg, South Africa. This butterfly is univoltine, with historical records indicating that adults fly for approximately 10 days in early October. It was last seen in 2002 and was Red-Listed as Critically Endangered (Possibly Extinct). The cause of the extirpation of the type population was inappropriate burning of its habitat during the adult flight period. A new colony was recently discovered in October 2014 at a site 46 km N of the type locality by citizen scientists from the Lepidopterists' Society of Africa. This study clearly highlights that developing countries, which are often limited in resources, can benefit hugely from the contributions of citizen scientists to conservation initiatives.

Keywords Conservation; COREL; Critically Endangered; Lepidopterists' Society of Africa

Insects form the most species-rich group of land animals. Following increased awareness of the vital functions they perform in many ecosystems, their conservation has assumed considerable worldwide importance (New 2012). Butterflies, being the most popular of the invertebrate groups, have often

been the focus of such conservation projects. South Africa, with its high levels of invertebrate endemism, has not lagged far behind these worldwide initiatives (Ball 2012).

Following the establishment of the Lepidopterists' Society of Africa (LepSoc) in 1983, the conservation of African butterflies, especially those endemic to southern Africa, has been well publicised (e.g. Steenkamp and Stein 1999). LepSoc was initially started as an organisation to promote overall knowledge of the biology of these insects. LepSoc's focus has shifted over the years from providing a communication platform for specialists and collectors, to a wider, more conservation-based approach. Many LepSoc members are amateur naturalists and self-taught scientists (i.e. citizen scientists) that have contributed significantly to our knowledge on African Lepidoptera (e.g. Mecenero, et al. 2013).

Based on the South African National Botanic Institute's (SANBI) successful 'Custodians of Rare and Endangered Wildflowers' conservation programme (CREW 2009), LepSoc recently launched the 'Custodians of Rare and Endangered Lepidoptera' (COREL) initiative to promote and ensure the conservation of threatened South African Lepidoptera (Edge 2011a; Edge and Mecenero 2015). Due to limited resources, COREL focussed on 15 Critically Endangered South African taxa, of which *Dingana fraterna* Henning & Henning 1996 (Lepidoptera: Satyrinae) was one. All COREL projects have been initiated and carried out by LepSoc members themselves, which is highly encouraging for African invertebrate conservation, given the limited number of professional lepidopterists available in Africa.

The genus *Dingana* van Son, 1955, commonly known as the Widow butterflies, comprises seven species which are all endemic to southern Africa. All species fly in small colonies, have narrow distributions and inhabit high-altitude temperate grasslands, preferring steep, rocky S facing mountain slopes (Woodhall 2013). By 2009 three of the seven *Dingana* species were Red-Listed (Henning et al. 2009): *D. clara* (van Son, 1940) as Endangered; *D. dingana* (Trimen, 1873) as Vulnerable and; *D. fraterna* as Critically Endangered. The Stoffberg Widow was described from several specimens collected in 1984, 1986 and 1996. At that time this butterfly was only known from a single locality a few hectares in size near the town of Stoffberg, Mpumalanga, South Africa (25°27'S; 29°50'E; 1600 m a.s.l.) (Fig. 2).

Between 1996 and 2002 annual monitoring by LepSoc members found the only known population to be relatively stable. However, despite repeated annual visits to the type locality over the last 13 years, this butterfly was last seen in 2002 (Henning et al. 2009). This resulted in its Red-Listed status being downgraded to Critically Endangered (Possibly Extinct) by Mecnere, et al. 2013. Potential threats to this population were identified as its localised range, inappropriate habitat management and airborne pollution from nearby mining operations (Henning et al. 2009). The actual cause of the extirpation of the type population was inappropriate burning of its habitat during the adult flight period (G.A. Henning, *pers. comms.*).

Very little is known about the ecology and biology of this species. The type locality is situated on the steep and rocky SE slopes near the base of a deep valley on the eastern escarpment of the Highveld plateau. The vegetation is grassland interspersed with *Protea* bushes (Edge 2011a) and is classified as Rand Highveld Grassland (Mucina and Rutherford 2006). This butterfly is univoltine, with historical records indicating that adults fly for approximately 10 days at the beginning of October (Henning et al. 2009). At the type locality, adults were never commonly encountered, with usually less than 10 individuals seen on any one day.

After the Stoffberg Widow's disappearance from its only known locality, further ad hoc searches were conducted by voluntary and interested LepSoc members to find other colonies. Quantifying the effort in terms of man power required to rediscover this species is difficult given the informal nature of the searches. The location of potential sites was based on the similarities of topography, aspect and vegetation to that of the type locality. One site, near the township of Dindela, Limpopo Province, South Africa (25°03'S; 29°46'E; 1860 m a.s.l.), 46 km N of the type locality was identified as a potential site. The butterfly was rediscovered on the 20 October 2014 at this site. A total of 17 butterflies were observed on this day, all initially limited to an area of roughly one hectare (Fig. 3). A further two visits were made to the site at two weekly intervals, and the butterfly was found to be more widespread over the S facing mountain slope. Total area of occupancy was estimated to be no more than three hectares. Forty-eight butterflies were observed over the three visits, with the last individual (a worn female) seen on the 15 November 2014.

Although based on limited observations at present, there are several differences between this newly discovered population and that of the extirpated type locality population. Most notably, is the later and longer flight period of the adult butterflies, and the higher elevation of this new colony. A deeper understanding of its life-history requirements are necessary for its successful conservation. To this end, members of LepSoc are currently breeding the early stages of this species. The early stages of the Widow butterflies are very poorly known and take up to a year to complete. Like many Satyrinae, Widow butterflies scatter eggs while on the wing. Even though many Satyrinae can be bred on numerous grass species, finding the natural larval foodplant/s will be challenging. Also, work will be carried out on identifying the important biotic and abiotic requirements of the adult butterflies. Casual observations indicate that adult butterflies roost in rock areas, possibly for suitable microclimatic conditions. Information on the early and adult stage requirements will certainly assist in identifying further potential colony sites. As this butterfly is still only known from a single site, finding further colonies or suitable sites is a conservation priority. Both this new site and the type locality site are not situated in any conservation protected areas making them highly vulnerable to anthropogenic impacts. The short flight period and highly localised nature of this species will make finding other colonies difficult. Once a more complete understanding of its habitat requirements is gained, the potential for introducing this species back to the type locality and other potential sites can be considered.

The important contribution citizen scientists can make to invertebrate conservation is clearly illustrated here. The citizen science approach has been successfully implemented in highly developed countries such as the United States (Braschler 2009). LepSoc has also implemented numerous successful conservation projects on other threatened South African butterflies such as the Brenton Blue, *Orachrysops niobe* (Trimen, 1862) (Edge 2011b), the Roodepoort Copper, *Aloeides dentatis dentatis* (Swiersta, 1909) (Deutschländer & Bredenkamp 1999), and the Heidelberg Copper, *Chrysoritis aureus* (van Son, 1966) (Henning et al. 2009). Furthermore, in developing countries, which are often limited in resources, conservation initiatives can benefit hugely from the contributions of citizen scientists. Many of these developing countries often have a rich and poorly known biodiversity frequently in need of conservation research.

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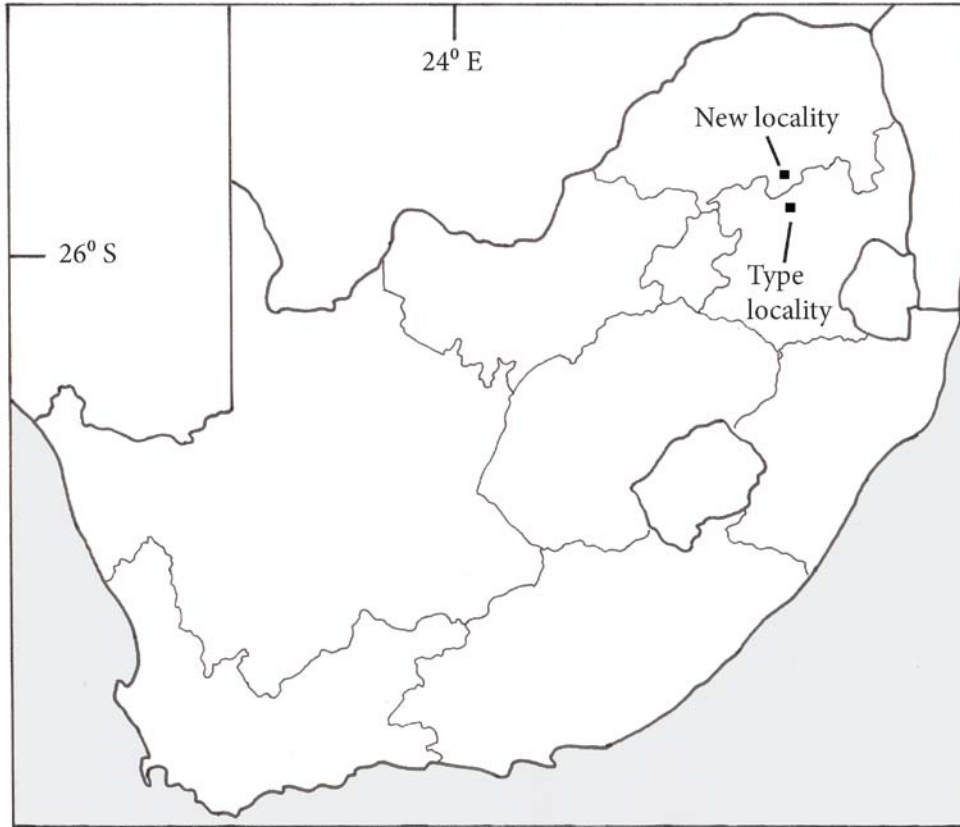


FIGURE 1

Figure captions

Figure 1. South Africa, showing the distribution of the Stoffberg Widow, *Dingana fraterna*