The Mohamed bin Zayed Species Conservation Fund

Kedestes Butterfly Conservation Project Report

(Project no: 172517187)

January 2018- January 2019

Contents

Please refer to the separate Kedestes Butterfly Conservation Project Gallery – January 2018-January 2019, for images referenced in the below report. Images will be referenced as follows – (I.1, I.2 etc).

Introduction

The Kedestes Butterfly Conservation Project was formed after a two year Masters project by a student at the University of Cape Town, indicated that both the Barber's Cape Flats Ranger (*Kedestes barberae bunta*) (I.1) and the False Bay Unique Ranger (*Kedestes lenis lenis*) (I.2) were in a precarious position, with *K.b.bunta* on the brink of extinction within the next five years, in the absence of immediate conservation measures.

A Kedestes Conservation Committee (KCC) and a Kedestes Scientific Sub Committee (KSC) including stakeholders from a range of disciplines (the City of Cape Town's Biodiversity Management Branch, the Lepidopterists Society of Africa, Nature Reserve Managers, Biodiversity Advisors, the University of Cape Town) was quickly formed in order to develop viable and scientifically informed management strategies for these imperilled butterflies.

The project was able to kick start into action at the beginning of 2018, predominately as a result of the funding awarded by the Mohamed bin Zayed Species Conservation Fund.

Project Location

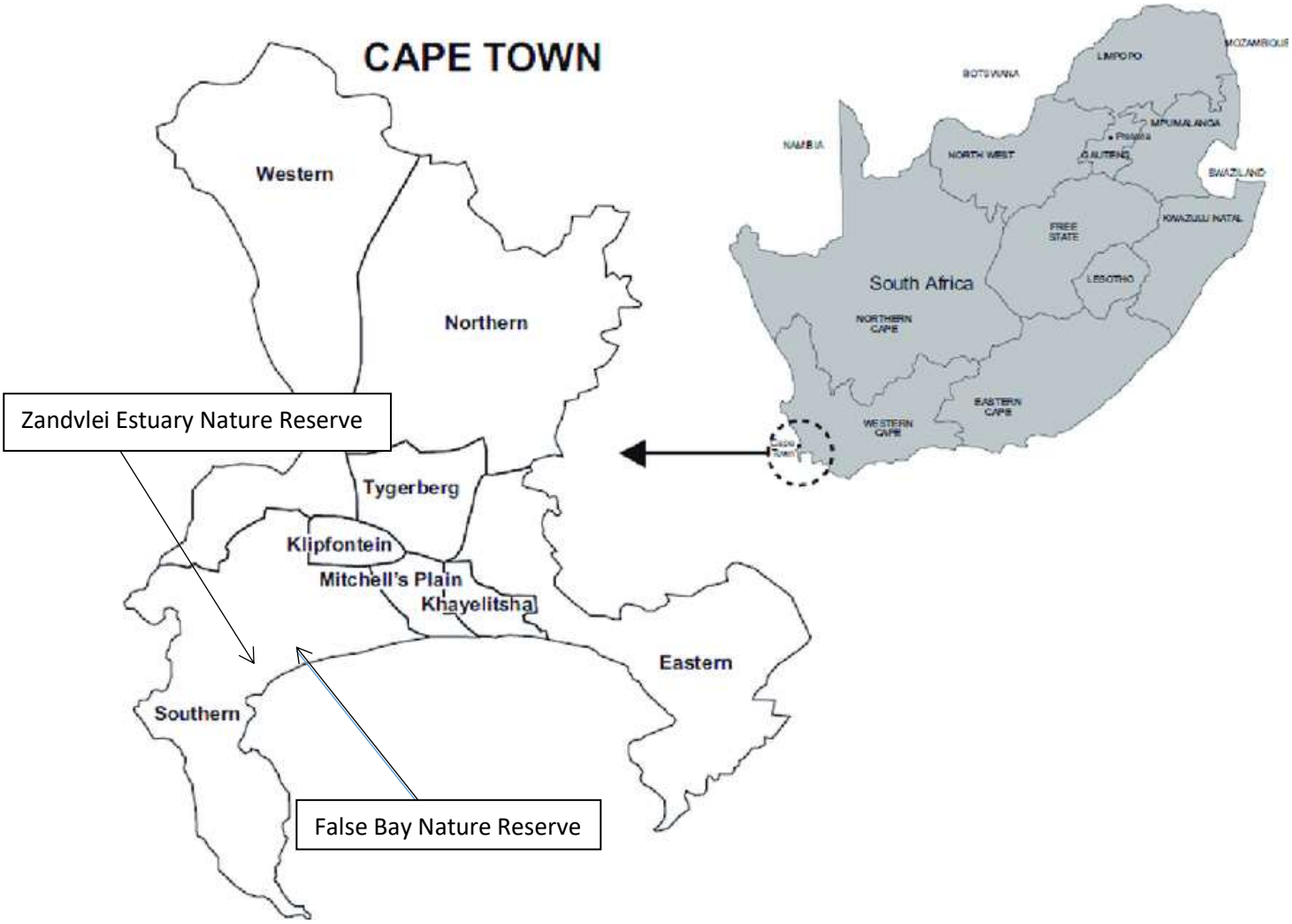


Figure 1. Study Area. False Bay Nature Reserve and Zandvlei Estuary Nature Reserve located along the False Bay coast, on the southern side of Cape Town, South Africa.

The project is located in the Western Cape, near Muizenberg (an area in the southern suburbs of Cape Town, South Africa. Field work is carried out in the False Bay Nature Reserve (FBNR) (the only locality for *K.b.bunta*) and Zandvlei Estuary Nature Reserve (ZENR).

Overall Project Objectives

The overall objectives of the project are to secure the future of the Critically Endangered *K.b. bunta* and the Endangered *K.l.lenis* on the Cape Flats through habitat management, in-situ conservation, ex-situ captive rearing and breeding and reintroduction at suitable sites.

Habitat Management (I. 3-23)

False Bay Nature Reserve

Both butterfly species have been found at 11 habitat patches within the FBNR. These patches are home to the last remaining population of *K.b.bunta*, and estimated 50-60 adults annually, so work to protect and improve these areas was given precedence. These habitat patches are located along a busy main road and in close proximity to residential dwellings, as such it was decided that firebreaks be created along Strandfontein Road to protect five patches . A dedicated team created a total of 4.5km of firebreaks as well as removing a huge amount of litter and alien invasive species from the habitat patches. Firebreaks at the six remaining patches were not deemed necessary as an existing footpath is currently serving the same purpose.

During the 2018 surveys, the project team were witness to the impacts of the three year drought which Cape Town has been experiencing. Many of the habitat patches were in a poor state of health, with three of the grass patches having died back completely. This in turn has led to a number of pioneer species to encroach on the habitat patches. After review from the City of Cape Town's Biodiversity Management Branch a Cape Flats Dune Strandveld, dune slack wetland subsidiary plan has been written. It details how the driving ecological forces behind this vegetation type have been disrupted (herbivory, fire regime, ground water levels) and what management interventions should be implemented to return it to a functioning system. Once approved this plan will be implemented within the butterflies habitat patches.

Zandvlei Estuary Nature Reserve

Over 15 years ago a small area at ZENR was restored in keeping with the endangered Cape Flats Dune Strandveld, dune slack wetland vegetation type, of which both butterfly species rely. This included the planting of the butterflies' host plant *Imperata cylindrica.* One of the objectives of the Kedestes project is to reintroduce *K.b.bunta* to sites in which they historically occurred, but were lost due to urban development and other anthropogenic influences. ZENR is one such site, with specimens collected from this locality over 60 years ago. As such the restored habitat at the nature reserve was assessed using a 'Site Criteria Checklist' by the KSC, to deem whether it was an appropriate host site for a reintroduction of *K.b.bunta*. The habitat was deemed appropriate and a list of management interventions were carried out:

- The habitat patch had not burnt for 15 years, leading to the *I.cylindrica* becoming senescent. From the results of the Masters study it was found that *K.b.bunta* favours patchy habitat with young growth on which to oviposit its eggs. As such, half of the grass patch was mowed to simulate a fire and create more suitable habitat for *K.b.bunta*.
- Invasive grasses and forbes were removed from within the patch, to leave room for *I.cylindrica* to spread.
- Encroaching bush was removed from the interior of the grass patch and thinned out along the edges.
- Alien invasive species were removed.
- Open sandy areas were created around the patch, in order to allow for seeds to be sown which would become nectar sources for the butterflies (species were selected from a list created from the Masters research).
- Artificial mole rat mounds were created to replicate the egg laying habitat niche that *K.b.bunta* favours.
- Throughout the year a number of different plant species were planted, some of which would serve as nectar sources for the butterflies with others adding to the restoration of the adjacent wetland area.
- Sods of *I.cylindrica* were translocated to open areas to increase the distribution of the host grass.
- Ongoing weeding and upkeep is needed to keep the invasive species and weeds under control.

Identification of New Sites

During the year a number of potential new sites for future reintroduction were identified, the first of which were three *I.cylindrica* patches within the ZENR (Fig. 2). These patches are close to the original type locality of *K.b.bunta*. These natural patches have also become very senescent due to the lack of fire and plans are in place to apply to the City of Cape Town to conduct an ecological burn during the first few months of 2019. During the flight season of *K.l.lenis* (Nov-Dec) these patches were surveyed for the first time and small numbers of adult butterflies were observed.

These patches are approximately 200m from the reintroduction host site (mentioned above) and due to their proximity it was felt that *K.l.lenis* may have migrated to the man-made site during the last 15 years. With this in mind surveys were also carried out at the study site and *K.l.lenis* was positively recorded. After discussions with numerous specialists it was discovered that this may be the first natural colonisation of a man-made habitat restoration site by an Hesperiid.

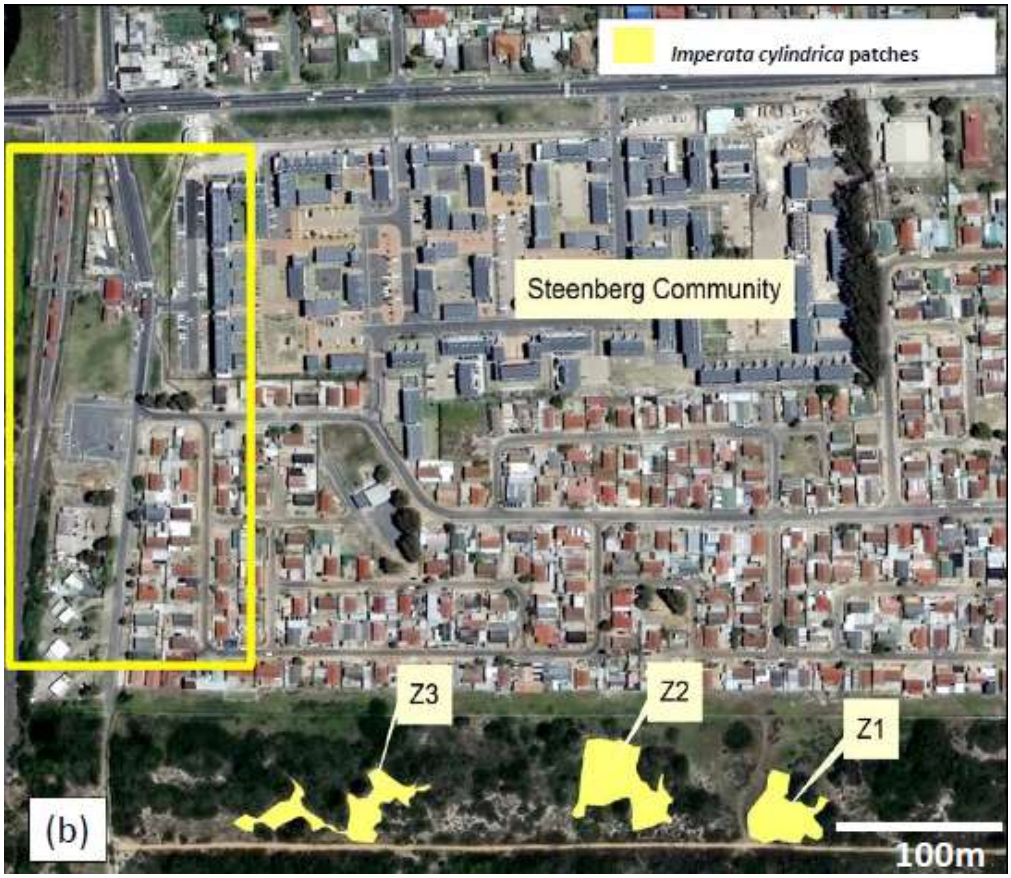


Figure 2 *I. cylindrica* patches within Zandvlei Estuary Nature Reserve. Yellow rectangle indicates the type locality of *K.b.bunta*.

At the FBNR a proposed housing development and subsequent EIA led to a new site being recorded. As the flight season for *K.b.bunta* had already ended the project team were unable determine whether this was a new site for the species. They were however able to collect a small number of eggs for rearing, with the hope that they could be positively identified as *K.b.bunta*. Unfortunately the larvae did not survive long enough to be identified. The site has been listed as potentially sensitive and the project team will visit during the next flight season (Sep-Oct) to conduct surveys, if *K.b.bunta* is observed it could have serious implications for the development.

As well as the identification of new sites, the KCC has also discussed the potential of carrying out habitat creation at localities close to the current populations. One site in particular at a nearby sewage works has been suggested, where old unused pans could be planted with *I. cylindrica*. These plans will be looked at in more detail during 2019.

Reintroduction of *Kedestes barberae bunta* at Zandvlei Estuary Nature Reserve (I. 24-41)

Due to the fact that *K.b.bunta* is currently only known from one site locality, it was deemed necessary to attempt to reintroduce the species at sites in which they were historically known, to act in part as an insurance population. The KCC carried out a detailed risk assessment in line with the IUCN guidelines on reintroductions and translocations and deemed the risks low enough to proceed.

Once the host site at ZENR was identified and habitat management was carried out, plans were put in place to collect *K.b.bunta* eggs during its flight season (Sep-Oct). Once the season commenced the project team initially spent time following gravid females to see if they would oviposit. However due to the low numbers of adults this was very inefficient and garnered no eggs. The team changed tact and carried out manual searches for eggs, this proved much more fruitful with 40 eggs (as per our permit) being identified. The eggs were GPS marked and other data such as whether the egg was laid in a sparse or dense grass patch and the location of the egg on the leaf were recorded. Another butterfly species, *Pelopidas thrax*, is also active during *K.b.bunta's* flight period. Unfortunately both of their eggs look identical and the larvae cannot be positively identified until well into their development (when their head capsules differ). As such the eggs were taken to the University of Cape Town to be measured under a microscope, with the hope that egg size could be used as an identification tool in the future.

At ZENR preparations had been made for the arrival of the eggs, with four exclusion enclosures being created within the habitat patch. The enclosures would prevent the eggs from being trampled and the grass from being eaten by grazers but were otherwise open to the elements and small fauna. Ten eggs were placed within each enclosure, with the egg and dissected section of the original leaf being superglued to a new host leaf. Each leaf was then labelled with a metal tag to aid monitoring.

Eggs were monitored on a daily basis from Monday – Friday with observations such as egg colour, presence of larva, evidence of shelter building or feeding damage being recorded. As time progressed (October 2018 – January 2019) the following key observations were made:

Larvae

- Ten eggs disappeared (8 of these within the first week), this is most likely due to predation by roaming ants.
- Three eggs never hatched, these could have been sterile.
- One glued section of leaf disappeared, most likely dislodged during windy conditions.
- Two larvae were found dead in their shelters.
- Predation by a jumping spider was witnessed for one larva.
- Of the remaining larvae, 20 disappeared during the monitoring period and are unaccounted for.
- All in all **only** three larvae survived, all of which were identified as the wrong species *P.thrax*.

Behavioural observations

- Once hatched larvae consume the majority of their chorion (egg shell), before they commence shelter building.
- Shelters are created by the larvae using a silken web to fold the leaf blade in half. They stay in their shelters throughout their life, coming out only to feed.
- Frass (excrement) flicking was recorded for the first time. Whereby the larvae reverse to the top of their shelter and remove the frass by flicking it.
- Larvae that hatched on very hot days and did not start building shelters or feeding were misted with water and found to actively drink. Once hydrated these larvae proceeded to create shelters and feed.
- Once older, larvae were observed creating much more complicated shelters which included the sewing together of multiple leaves.
- Older larvae were also observed traveling large distances (2ft) in search of new shelter building areas. Monitoring became much more challenging once larvae became more mobile. Their mobile nature could explain the high level of loss, as whilst out of their shelter they are very conspicuous and easy prey for predators such as birds.

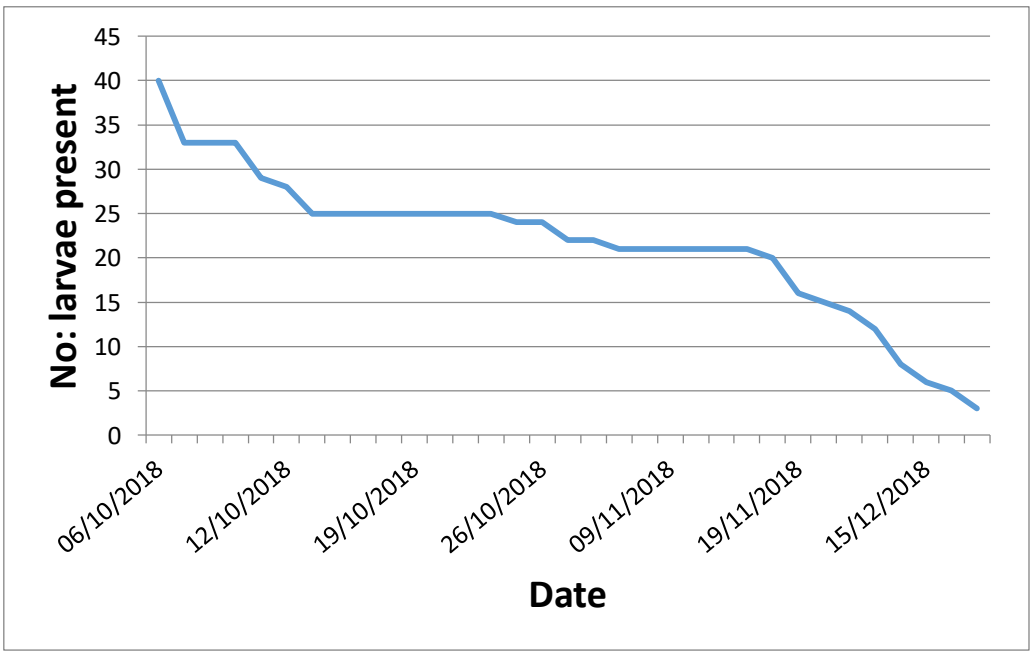


Figure 2. Number of larvae present over time at ZENR reintroduction site.

The method detailed above was decided upon by the KCC as the least intrusive option to begin with. Due to the low population numbers the KCC was not comfortable attempting to captive rear *K.b.bunta* in the first year of the project. This was due to the fact that it had never been done before. This method has shown that with translocation of eggs into the field there are too many variables that cannot be controlled in this open 'hands off' approach. The KCC have now agreed to proceed with captive rearing *K.b.bunta* in light of the current success had with *K.l.lenis* (detailed later in the report).

Population Abundance Surveys (I. 42-45)

Kedestes barberae bunta abundance surveys

- The *K.b.bunta* flight period usually begins at the beginning of September, as such visits to the FBNR sites were carried out from the middle of August with the first adult observed on the 10th September.
- Abundance surveys were carried out by a survey team (who were appropriately trained) twice a week throughout the flight period.
- Teams of 3-4 surveyors conducted abundance surveys as per the Pollard Walk method, whereby surveyors walk along fixed routes within the habitat patches recording individuals within a 5m width band.
- During the first week of surveying only a few male specimens (identified by their fast, flighty behavior) were observed, during the second week of surveying an increasing number of gravid females (identified via their very swollen abdomens and heavy flight behavior) were observed. Territorial and courting displays were also observed.
- During the flight period adult butterflies were recorded in 8 out of the 11 habitat patches.
- A total abundance index (sum of the highest counts from each habitat patch across the whole flight period) of 61 was calculated, compared to a figure of 22 in 2016 and 31 in 2015.
- The highest sum count during the flight period was 41 individuals on a single day compared to 17 in 2016 and 12 in 2015.
- Survey data indicated a peak abundance at the start of the flight period (Fig. 4) with a decrease over time.

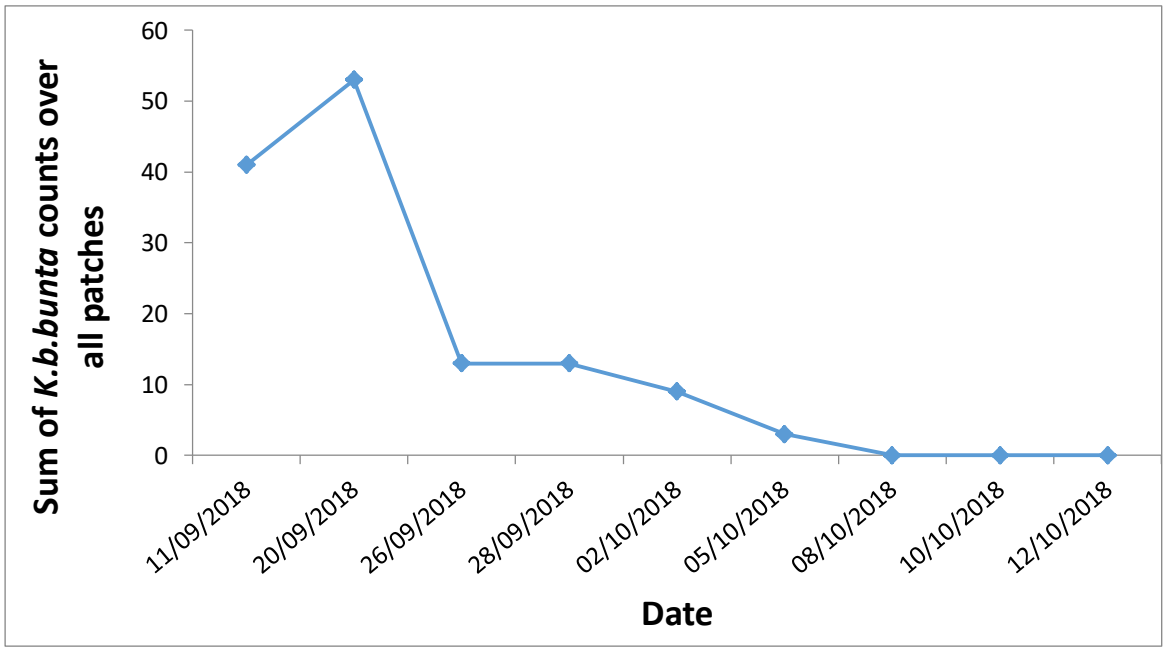


Figure 3. *K.b.bunta* abundance across all habitat patches during its flight period.

- A large variation in abundance over each of the habitat patches was noted.
- The increase in abundance since the last surveys in 2016 could be a result of the drought, due to the die off of grass and the increase in disturbance creating the habitat niche which *K.b.bunta* favours (open patches with new growth).

- The survey team also observed a noticeable increase in the number of annual flowering plants compared to the previous spring.

Kedestes lenis lenis abundance surveys

- The *K.l.lenis* flight period usually starts in November, as such visits to the FBNR habitat patches were carried out from the middle of October with the first individuals observed on the 5th November.
- Surveys were conducted using the same method as detailed for *K.b.bunta*.
- During the flight period adult butterflies were recorded in 10 out of the 11 habitat patches.
- A total abundance index (sum of the highest counts from each habitat patch across the whole flight period) of 116 was calculated, compared to a figure of 107 in 2015.
- The highest sum count during the flight period was 113 individuals on a single day compared to 92 in 2015.

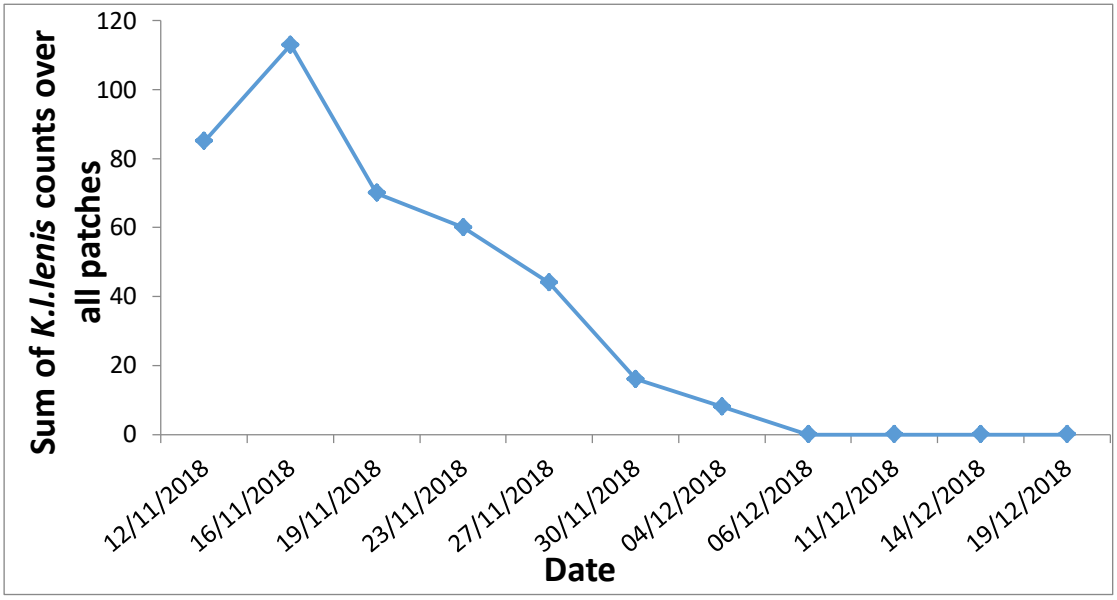


Figure 5. *K.l.lenis* abundance across all habitat patches during its flight period.

Captive Rearing and Breeding (I. 46-67)

During the first year of the project the KCC agreed to initiate a captive rearing programme for *K.l.lenis*, with the hope of successfully rearing *K.l.lenis* larvae through to adulthood. If successful the same techniques could then be utilised for the more threatened *K.b.bunta*. During the first few months of 2018 a number of sources were contacted to gain advice on how the captive rearing enclosure should be built and what the husbandry set up should look like. Contact was made with an Hesperiidae captive-rearing and breeding programme based at the Minnesota Zoo in the United Sates (the only one of its kind globally). The Dakota Prairie Skipper Programme is also working to save imperilled the butterflies from extinction. A good relationship with their Butterfly Conservation Specialist (Cale Nordmeyer) was established and ongoing correspondence enabled an appropriate enclosure to be built, husbandry protocols to be written up and host plants to be propagated.

Cale was awarded an internal grant to champion the Kedestes project and was able to visit during the *K.l.lenis* flight period in November. During his visit he assisted with; *K.l.lenis* population abundance surveys; *K.b.bunta* monitoring of thw translocated individuals; *K.l.lenis* egg searches and mapping; capturing of adult *K.l.lenis* butterflies to test captive egg laying treatments and provided guidance and assistance with the projects captive rearing setup. His visit was a great opportunity to gain a greater knowledge and understanding of captive rearing and breeding techniques and his help with all aspects of the project has been invaluable.

Ex-situ *Kedestes lenis lenis* eggs

During the flight period of *K.l.lenis* nine female and three male (as per our permit) individuals were collected and brought back to the captive rearing enclosure at ZENR (for a period of 72 hours). A number of different treatments were tested to see whether female individuals would lay eggs in captivity:

Treatment 1: Cups (Fig. 6)

- Cups were filled with host grass, a nectar source and honey water soaked cue tips. Females were added to the cups and netting secured over the top. This is the main method that the Minnesota Zoo uses for their non-host specific butterfly species.

Treatment 2: Pop up mesh cages (Fig. 7)

- Mesh cages (30x30cm) were set up with a potted host and nectar plant as well as fresh flower clippings.

Treatment 3: Aluminium cages (Fig. 8)

- Aluminium, cages (30x30cm) were set up in the same fashion as the mesh cages.

Treatment 4: Caterpillar hotels (Fig. 9)

- A host plant was enclosed by a 'Caterpillar Hotel' (65cm high) the same setup that was to be used for rearing the larvae, with the addition of fresh flower cuttings

The following key observations were recorded:

- Four females were placed in the cup set up and only one egg was laid. Interestingly the female that produced the single egg was moved to a mesh cage and subsequently laid a further 26 eggs. This served as useful data that the cup setup was not suitable for our host specific species.
- Only one egg was laid in the aluminium cage setup.
- Five eggs from one female were laid in the Caterpillar Hotel, this individual spent most of its time at the top of the enclosure and therefore not in constant contact with the grass. As such this individual was moved to a mesh cage (where contact increased) and laid a further 16 eggs.
- The most successful treatment overall were the mesh cages with a total of 81 eggs laid by five females.
- A total of 88 eggs were laid in captivity.
- One female died after spending 24 hours in captivity (when collected it was observed that she was already very tatty and was most likely nearing the end of its life). The remaining 11 butterflies showed now damage from captivity and were all released successfully.

Figure 6. Treatment 1: Cups.

Figure 7. Treatment 2: Pop up mesh cages.

Figure 8. Treatment 3: Aluminium cages.

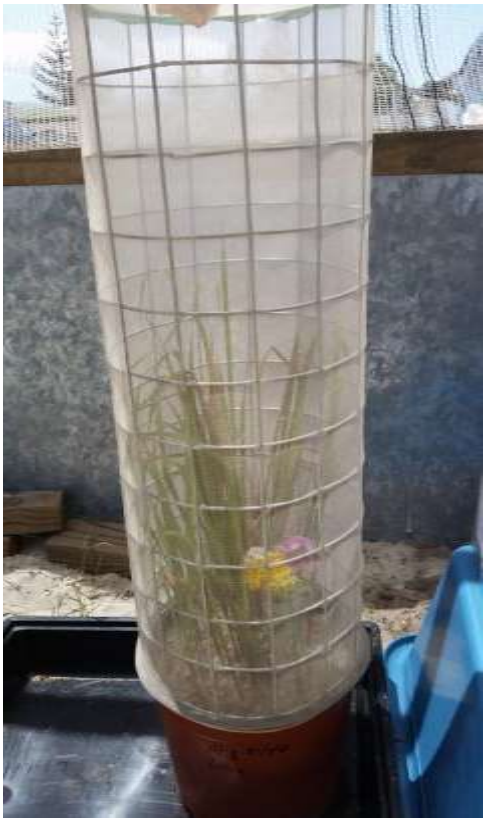


Figure 9. Treatment 4: Caterpillar hotels.

- The eggs were translocated onto new host plants within the Caterpillar Hotels and monitored daily.
- Larvae hatched on average after 14.5 days.
- Three eggs never hatched (all laid by the same individual).
- So far survival rates have been good with only two mortalities.
- The KCC has agreed that these larvae will be reared to pupation stage and once eclosed (emerged as adults) be utilised for captive breeding.

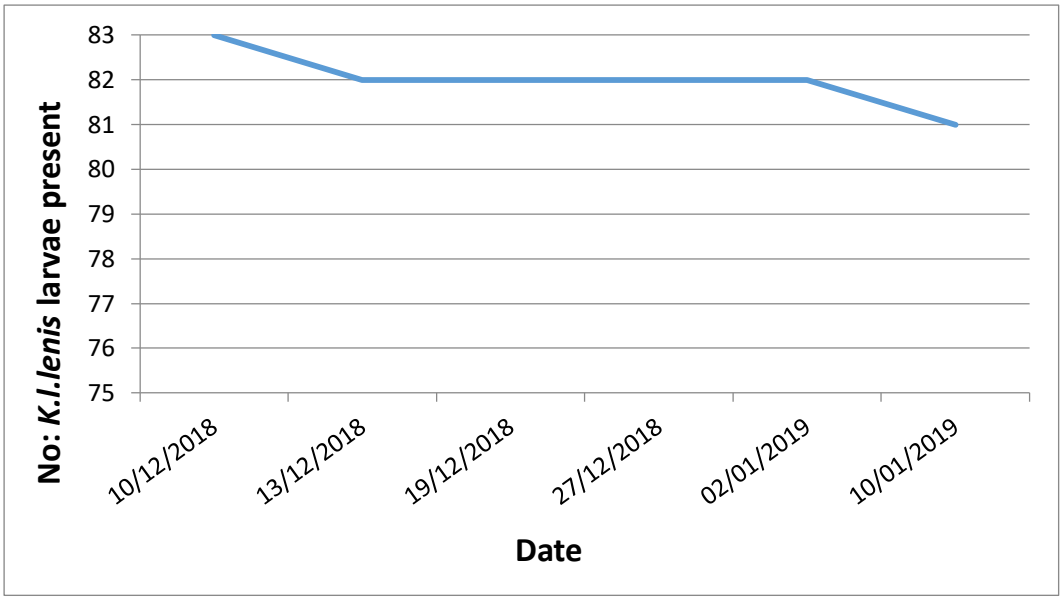


Figure 10. Number of captive reared ex-situ *K.l.lenis* larvae.

In-situ *Kedestes lenis lenis* eggs

As the success of captive egg laying was unknown, *K.l.lenis* eggs were also manually searched for and collected from the study sites. A total of 22 eggs were collected and added to Caterpillar Hotels. Of the surviving larvae only four have been identified as *K.l.lenis* and 15 as *P.thrax*. This data has shown that collecting eggs in–situ is very inefficient and that head-starting (collecting gravid females to lay in captivity) should be the preferred method in the future.

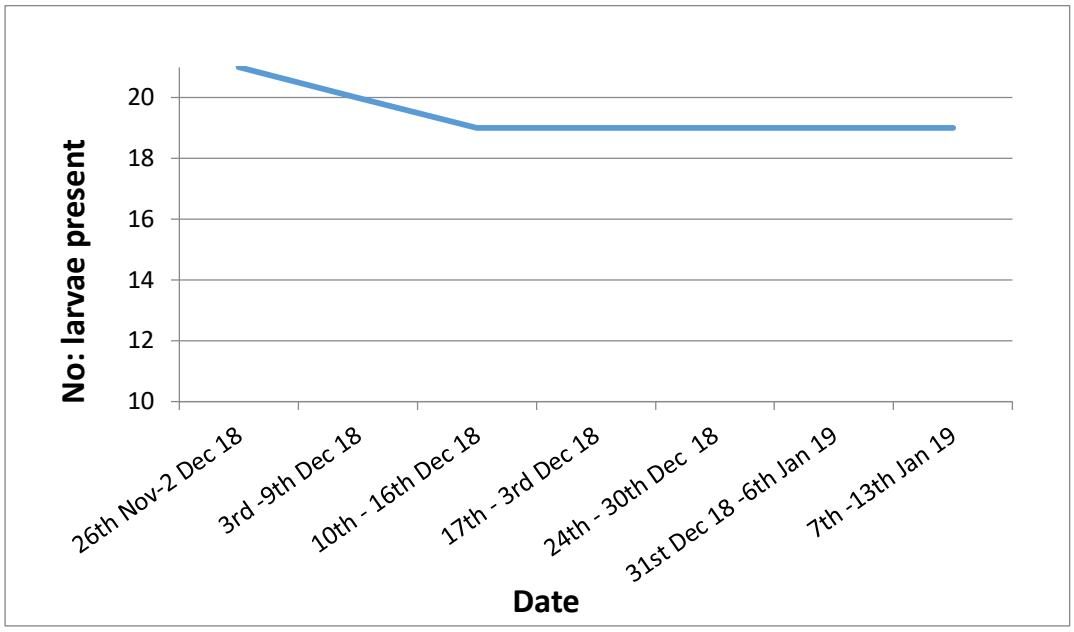


Figure 11. Number of captive reared in-situ *K.l.lenis* larvae.

Awareness Raising and Project Promotion

Throughout the year a number of avenues have been explored to help raise awareness of these threatened butterflies and promote the projects activities.

- The project was promoted at the Fynbos Forum, a symposium dedicated to research taking place within the fynbos biome of South Africa (Appendix. 1).
- An educational video to promote the project was created, please follow the link to view - https://www.youtube.com/watch?v=CJk4lohhQz0
- Social media platforms such as Facebook, Instagram and Twitter were utilised very successfully (please refer to the 'Kedestes Butterfly Conservation Project Social Media Report' for a detailed analysis), with a total potential reach of nearly half a million people.
- A number of videos documenting a range of larval behaviours were uploaded to Facebook and received a lot of interest:
    - https://web.facebook.com/capetownenvironmentaleducationtrust/videos/549388848910962/
    - https://web.facebook.com/cale.nordmeyer/videos/pcb.10100163229059767/10100163228974937/?type=3&theater
- The project was approached by a number of organisations to write articles for a range of audiences (please refer to the media documents uploaded on the reporting webpage to view these).

Summary

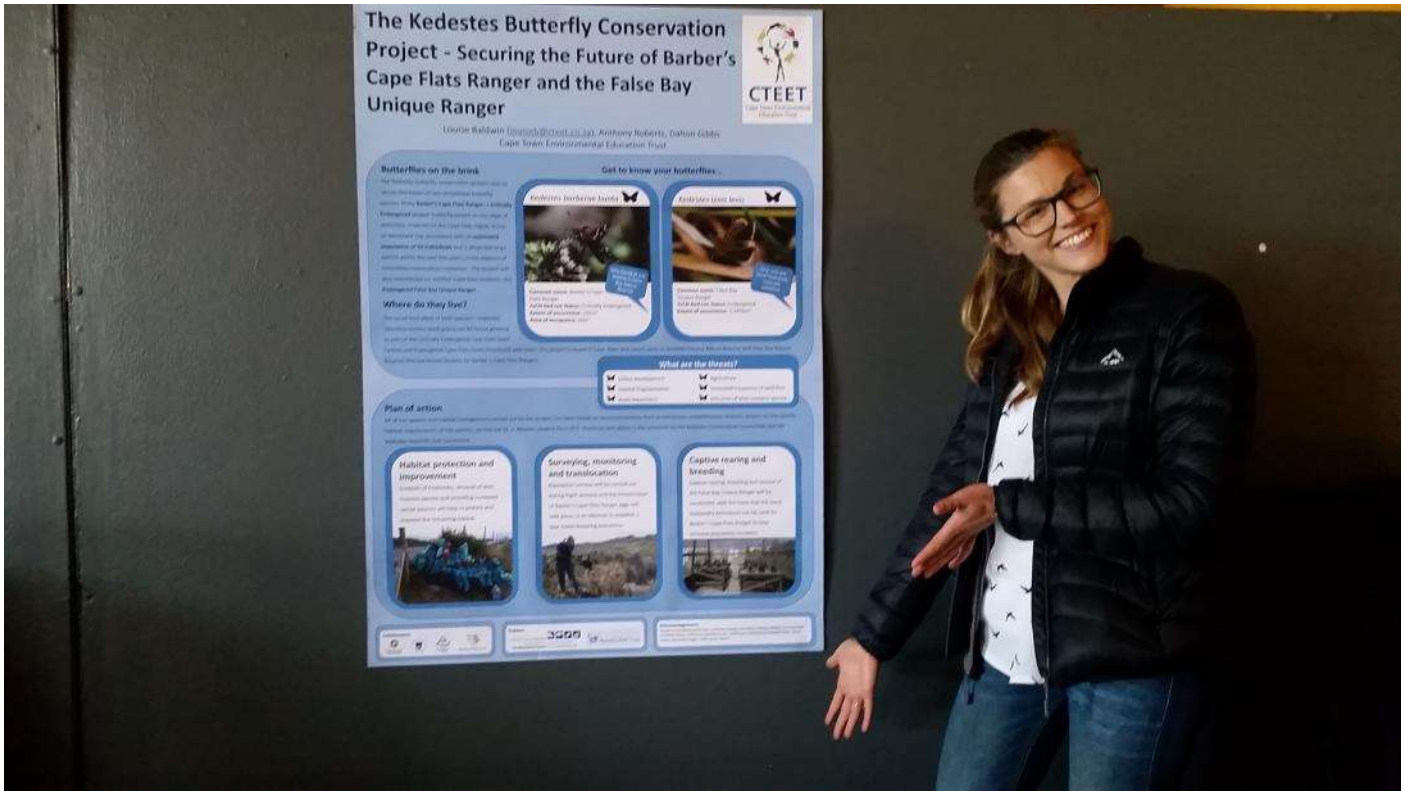
The last year has been an extremely busy one for the Kedestes Butterfly Conservation Project, with its first full field season being completed. Progress has been made on all aspects of the projects objectives, with the unexpected success of captive egg laying and captive rearing being a highlight for the year.

Key collaborations have been forged with the Minnesota Zoo and support for the project has been expressed by the IUCN SSC Butterfly Specialist Group (Appendix. 2). The upcoming year will bring new challenges (such as mastering captive breeding) but the KCC will continue to make sound management decisions to help secure the future of these imperiled butterflies.

The Kedestes Butterfly Conservation Project team would like to thank The Mohamed bin Zayed Species Conservation Fund for their support, as it has enabled the project to initiate the reintroduction and captive rearing and breeding of these threatened Hesperiidae butterflies, which has been noted (by the Lepidopterist Society of Africa) as unprecedented breaking work in the conservation of Endangered South African butterfly species.

Appendix

Appendix 1. Louise Baldwin, Project Manager presenting a poster on the project at the Fynbos Forum.



Appendix 2. A letter of support from the IUCN SSC Butterfly Specialist Group.

Zoological Society of London
Regent's Park
London
NW1 4RY
United Kingdom

Institute of Zoology

Re: ***Kedestes*** Butterfly Conservation Project

01 October 2018

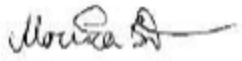
To whom it may concern,

I am writing as the Red List Authority Coordinator and Interim Chair of the IUCN/SSC Butterfly Specialist Group to show my support for the "Kedestes Butterfly Conservation Project" . The IUCN/SSC Butterfly Specialist Group is working towards the assessment of the world's butterflies and developing conservation strategies and action plans to ensure their continued survival. This project, to save two South African endemic *Kedestes* butterflies from the Cape Flats region from extinction, is a project we strongly support, for the reasons listed below:

1. While neither species has yet been assessed for the global IUCN Red List, these South African endemics have been assessed on the South African National Red List as **Critically Endangered** (*Kedestes barberae bunta*) and **Endangered** *Kedestes lenis* lenis), respectively.
2. Given the extensive preliminary work which has already been carried out to elucidate the habitat and developmental needs of the two species, the project really can hit the ground running: **no preliminary work is required** and all funds can go straight into the proposed activities of improving, maintaining and protecting sites at which the species have been identified; ensuring adequate monitoring of the species' status at these sites; preparing potential reintroduction sites and developing a captive rearing population to improve survival of this species by bolstering numbers for reintroduction. In addition, the project aims to produce a new viable population at Zandvlei Nature Reserve.
3. These actions are **key actions required to ensure the survival of threatened butterflies** which are highly restricted in range due to specialised habitat requirements and have low population numbers: in these cases, focus must be on providing good quality existing and new habitat patches and providing a captive source to bolster population numbers in future.
4. The project is **urgent** – *Kedestes barberae bunta* is projected to go extinct within the next five years, if no conservation actions are put into place.
5. The project has a **high chance of achieving its aim** of ensuring the survival of this species, especially since the project team consists of some of the top Lepidopterists in South Africa, highly capable project managerial staff, and project collaborators which are experts in habitat management for skippers and their captive breeding.
6. In addition, support for invertebrate conservation presents **excellent value for money** as interventions are relatively cheap compared to those for other taxa; success can be detected relatively quickly due to the biology of the species; and projects such as this put a spotlight on the often overlooked and underappreciated species which are hugely important components of our ecosystems.

The IUCN/SSC Butterfly Specialist Group wholeheartedly supports this project and wishes the project staff and collaborators all the best in their endeavour. The IUCN/SSC Butterfly Specialist Group also looks forward to working with the project staff to ensure that lessons learned from the project are fed into other conservation project of a similar nature and that new findings on the species are incorporated into conservation assessments in a timely fashion.

Best wishes,



Monika Böhm

IUCN/SSC Butterfly Specialist Group Red List Authority Coordinator & Interim Chair