GrazingFutures Case Study

Capturing grasshopper impacts across northern and north-west Queensland following wet season rain

Summary

Large and damaging grasshopper populations have impacted northern and north-western parts of Queensland—up to a quarter of the state—following rain in early 2020. This resulted in significant pasture damage and economic losses across large areas.

In response, a semi-constructed producer survey was instigated. This initiated 56 responses across the regions. Receiving this number of responses provided useful data for further analysis and enabled substantial contact with producers. It also gave producers an opportunity to be heard and to share their experiences while the event was actually taking place.

The survey was initated in an endeavour to gain a better understanding of grasshopper population dynamics, to observe trends over time and to capture pasture destruction and levels of economic impact. These estimates will better position GrazingFutures project officers in supporting potential future funding opportunities and research submissions.

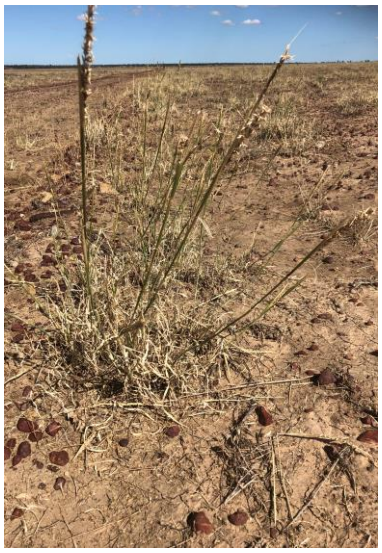

Figure 1: Stripped and detached Mitchell grass seed heads
***Photo*:** Leanne Hardwick, DAF

Background

Figure 2: *Novum* sp.
Photo: Clare Mulcahy, APLC

Rainfall across northern and north-western Queensland in early 2020 created ideal hatching conditions for significant and damaging populations of grasshoppers. Large areas of pasture destruction caused by these grasshoppers were being reported. After engaging with producers about this issue, Department of Agriculture and Fisheries (DAF) GrazingFutures project officers realised that only partial advice and support could be provided. This was due to limited knowledge of the behavioural patterns and life cycles of the prevalent grasshopper species and the fact that there was no previous data against which to compare.

In response to the concerns raised by affected producers, Leanne Hardwick (DAF Longreach) contacted the Australian Plague Locust Commission (APLC) and Biosecurity Queensland (BQ) for assistance with identification and any existing knowledge on the prevalent grasshoppers. Clare Mulcahy from the APLC assisted with identification of the species present and provided information on the life cycles of grasshoppers. Little specific knowledge is available on the five main grasshopper species observed; the three most prevalent being *Peakesia* sp.*, Stropis* sp. and *Novum* sp..

The grasshoppers responsible for the significant pasture damage of 2020 were identified as 'hopper' types, meaning they have small or under developed wings. The grasshoppers experienced throughout the region were therefore unable to fly large distances like locusts do, so there was more localised damage.

Figure 3**: **Left**:* Exoskeleton of *Peakesia* sp. grasshopper shed when transforming from fourth to fifth instar; ***Right: Adult *Peakesia* sp. ***Photos***: Leanne Hardwick, DAF

Many grasshoppers go through five stages of instar development before fledging into an adult (*Figure 3*).

Concern from producers spiked interest from GrazingFutures project officers to investigate the grasshopper invasions further and collect comparative data for Western Queensland. A survey provided to producers was commenced as a data collection initiative and as a way to support these producers by ensuring their concerns were heard. It also allowed the GrazingFutures team to capture valuable and far-reaching observations and to identify the severity of impacts to grazing businesses. It aimed to highlight key issues such as:

Figure 4: Catching grasshoppers north of Longreach in March 2020
***Photo**:* Clare Mulcahy, APLC

- species identification,
- extent of grasshopper distribution,
- resultant pasture damage
- estimates of economic impacts

By highlighting the damage caused to industry, the data provides good baseline evidence to support funding applications for future scientific investigations. It is anticipated that such research could lead to a better understanding of the ecology and life cycle of grasshoppers and assist in determining population dynamics. Once this is known, the information can be used to predict severe grasshopper populations and allow timely management decisions. This would allow more time to analyse the best options to prevent large economic impacts.

This research may also contribute to finding ways to break grasshopper life cycles and could, in turn, lead to some possible control opportunities.

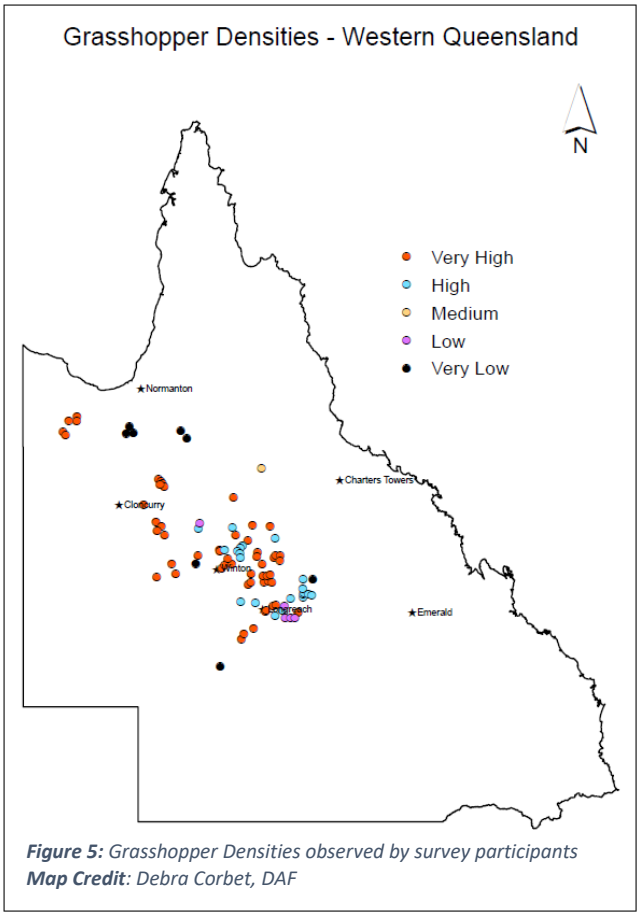

Figure 5: *Grasshopper Densities observed by survey participants*
Map Credit*: Debra Corbet, DAF*

Body

A total of 56 producers responded to the *Grasshopper Impact Survey 2020*. Key issues and impacts identified included:

- grasshopper distribution and numbers,
- resultant pasture damage,
- management responses, and
- estimated economic impacts.

Effects were observed across approximately a quarter of the state (see Figure 5). Most observations occurred in areas from Hughenden to Prairie and then to Corfield, Winton, Muttaburra and Longreach. They also extended from Aramac to Barcaldine through to Ilfracombe, south to Isisford; and from Longreach to west of Stonehenge and Jundah. In the north-west region, grasshopper impacts occurred primarily from Richmond and Julia Creek with observations also coming in from McKinlay, Kynuna and the Gulf.

The impact from grasshoppers was wide-ranging throughout the regions. The survey showed that 80% of respondents compartmentalised their numbers at high to very high volumes. These numbers resulted in severe destruction across 20% to 90% of each impacted property.

"All new growth was just chewed for weeks on end. We take great pride in looking after our country, but you can't budget or plan for this." — Producer north-west of Longreach.

Approximately 50% of the 2020 grasshopper survey respondents were also impacted in 2019. However, impacts in 2020 were noted to be across larger areas and to have caused more destruction.

> *"Our main concern is that it is becoming a yearly event and in seemingly bigger numbers. Coupled with low rainfall years it is very difficult to rest or spell pasture for drought recovery as often the grass can't even make it to seed before the grasshoppers destroy it."* — Producer north-east of Winton.

The survey responses indicated that grasshoppers were active across Mitchell grass downs areas and into some spinifex country, causing devastation by consuming a large variety of plants and pastures in the paddock and even in some home gardens.

Figure 6: Grasshopper east of Longreach
Photo: Leanne Hardwick, DAF

The majority of survey responses indicated the grasshoppers were more concentrated in areas of lighter rainfall and shorter pasture with herbage.

"*Seemed to be worst where the rain was less (150-175mm) and the feed was shorter. Where we had 250 to 300mm they were not as bad, or they didn't seem to do the same damage there*". — Producer north of Winton.

However, some survey respondents observed that impacts were also significant in higher rainfall areas with healthy pastures.

"*Having low grass cover has made the damage worse. Any seedlings are lost, the impact on condition is massive. It has held up the (pasture) recovery*"—Producer in the Winton region who received lighter rainfall.

Changes to Management

Producers could not plan or budget for the level of impacts experienced. With large reports of destruction to pasture plants resulting in degradation of pasture condition, many producers have had to re-evaluate their position going forward. This caused significant interruptions to management practices and had severe impact on potential cash flow.

Figure 7: Grasshopper nymph
Photo: Leanne Hardwick, DAF

A variety of adaptive measures were put in place by survey respondents. Broadly, these fell into the following categories:

- earlier weaning and destocking
- forgone potential wool clip and liveweight gain opportunities
- selling of key breeders
- forgoing opportunities to restock after drought and re-build herds
- sourcing agistment
    - Agistment comes with its own challenges. It is often difficult to find and increases costs significantly.

***Figure 7**: Stropis* sp. adult
Photo: Leanne Hardwick, DAF

"Loss of approx. $200,000 due to having to sell stock sooner than budgeted. Current stock numbers are at their lowest in the 47 years of operation of this business."—Producer north-east Winton.

Economic impact estimates from producers came in many different forms and the GrazingFutures team members will be working with economists and other specialists to calculate monetary figures. A quarter of producers provided an economic impact estimate to their business. Initial figures indicate that average economic impact equates to approximately $300,000 per business; these figures varying from $24,000 to $1,000,000 in losses. With only a quarter of producers providing a figure and there being such variation in this figure it is hard to provide an accurate value of economic impact until further analysis is done.

Figure 8: Grasshopper species captured using a net
Photo: Clare Mulcahy, APLC

Challenges

Chemical Use

A question regarding the feasibility of chemicals as a method of control was raised. Upon discussions with BQ and other departmental staff, it was highlighted that some chemicals could be used but none were actually registered for these particular species of grasshoppers. Each producer would need to evaluate their situation through a cost-benefit analysis, on a case-by-case basis, as implementation at this stage is the producer's responsibility. Chemical control also comes with its own challenges with issues arising from:

- the time needed to gain a minor use permit for use of restricted chemicals (by which time the grasshopper population may have abated)
- potential changes to the ecosystem from the use of chemicals
- potential impacts on property organic status
- the costs involved.

Figure 9: Grasshopper nymph of the Peakesiina subtribe
Photo: Trevor Hall, DAF

Gaps in Survey Responses

Undertaking a survey of this nature also presented some challenging issues. Being a semi-constructed survey meant there were open-ended as well as multiple-choice questions. This allowed for indirect answers, which were particularly challenging when it came to the economic analysis questions. Many producers found this difficult to predict, particularly as the grasshoppers were still impacting their country at the time of completing the survey. A solution for this in similar situations in the future may be to have a multiple choice question with ranges of predicted economic impact. This would assist in providing a larger data set of estimates of actual figures and alleviate the gap in answers we received regarding this question.

Gaining survey responses is always a challenge. While we were impressed with 56 replies, some producers who spoke with the GrazingFutures team members indicated that their neighbours had been significantly impacted, but had not responded to the survey. By engaging even more producers (especially those most heavily affected), a more comprehensive data set can be developed.

Recommendations

Predicting desirable conditions for hatching and thriving of grasshopper populations could assist in more timely management decisions. Through the survey, project officers have been able to obtain some insights of desirable hatching and living conditions for these grasshoppers in the region.

Figure 10*: Novum* sp.
Photo: Leanne Hardwick, DAF

Further targeted research is needed to establish a better understanding of life cycle and ecology of these grasshoppers. This would help determine the triggers for ideal conditions for grasshopper population booms. Producers would then be able to, with assistance from Bureau of Meteorology (BOM) observations and forecasts, predict population intensity and timing.

Population predictions would allow for early changes to management; pro-active changes rather than re-active. This could involve:

- earlier planned weaning and culling rather than forced sales
- planned sales or looking for agistment early to prevent this stress
- not purchasing stock in response to rain to then have to sell
- forage budgeting before then after grasshopper invasions to match stocking rates
- implementing possible control methods in a timely manner

It was also observed by producers that there were two or more lifecycles throughout the season. If affected property managers could control populations at this first cycle or at the nymph stage, impacts may not be as severe.

Anecdotal evidence and discussions with producers indicated that a cold snap in May caused a reduction in numbers and provided some relief for both pastures and producers. Data on ideal temperatures for population decline would allow producers to understand when population reductions are likely to occur.

Figure 10: *Peakesia* sp.
Photo: Leanne Hardwick, DAF

Conclusion

Investigations into the impacts caused by grasshoppers across northern and north-western Queensland has aligned with GrazingFutures project objectives.

A better understanding of population dynamics may assist with determining opportunities for implementation of more timely management actions. This will provide support to western Queensland grazing businesses and assist in improving business resillience. It will aid in drought recovery should the occurrence of grasshoppers presents itself in the future.

Due to limited knowledge on the observed grasshopper species, the survey initiative allowed GrazingFutures team members to partner with government and non-government agencies such as the APLC and BQ, to find out more. In turn, this allowed the team to deliver comprehensive support to grazing businesses through the sharing of their concerns and observations.

Data from the survey has provided the GrazingFutures team with examples of grasshopper impacts experienced by producer businesses. It is envisaged that these estimates will assist in justifying applications for funding for research to determine an improved understanding of the life cycle and population dynamics of these grasshoppers. The survey has allowed for analysis and documentation of key learnings from grazing businesses. This can be used to assist producers in adopting objective measurements and to better plan for business risks.

Created by: Leanne Hardwick, DAF GrazingFutures, Longreach
Submitted: August, 2020
Permissions: External

Figure 11*: Previously productive pasture stripped by grasshoppers*