A SYSTEMATIC EFFECT OF STOCKING INTENSITY UPON THE SPECIFIC
DEFOILIATION RATE OF SALTBUSH BY SHEEP

This extends earlier studies of sheep grazing saltbush shrubland near Whyalla, South Australia, where time
spent in the different parts of the flock's range had been shown to be influenced by the corresponding depredations of the egesta. Result enables quantitative estimates (the 'sheep' ) to be made of the stocking intensities experienced in each of the different parts of the range (SIP - stocking intensity of the part), by combining flock size, part area, and range egesta accumulations in an
appropriate formula. It also has been shown that SIP varies greatly throughout each flock's range in a consistent way, whether in the full-scale paddocks of the region or in very small
experimental enclosures. Roughly a third of the range experiences SIP grading upwards from the paddock
average stocking intensity (PSI - total area divided by flock size), the remainder grading downwards. Greatest
intensities are of magnitudes equivalent to about 7 PSI; lowest measurable intensities have values roughly
equivalent to the PSI/10.

Lastly, it has been shown, in several cases, by use of a heat-marking technique that the extent of defoliation of saltbushes in the various parts of the range is linearly related to the concurrent accumulations of sheep egesta in those parts. Thus the situation has been reached where inferred SIP and its immediate effects on plants such as saltbush, can be studied across the various open
habitats, without constraining the flock's behaviour.

The present report describes an unexpected new-quantitative feature of those inter-relationships, revealed
from a small enclosure of saltbush stocked with sheep.

An enclosure 35 x 100 m was fenced off in the midst of an extensive saltbush shrubland on Middlesbrough Station near
Whyalla, S. Aust., a locality described in detail by Barkov
and Noble. The shrubland was dry and devoid of any green
grass, due to drought. Survey poles were set about this enclosure such that observers could visually sector it into ten equal cells, and each cell into halves, by lines
drawn. A drinking-trough and a holding pen were installed at one end.

In each cell, bushes were counted and 100 leaves of their outermost foliage were marked, distributing the marks
widely amongst the bushes. The percentage loss of saltbush foliage from each cell was estimated also by
the method of Andrews and N. A flock of seven merino
wethers (20 sheep ha ) was introduced and left for six
days, except for an inspection period every 24 h, during
which the sheep were penned. At each inspection, all egesta
was recovered and measured from each half-cell separately;
counts were made of the loss of marked leaves, and the
calculating foliage biomass was estimated in each cell. During
daylight, the activity of the flock was observed from a

Contrary to usual outcomes, the sheep in this enclosure
did not settle down for nearly three days. Instead they
spent much more time than expected in the southern
(downwind) end of the enclosure just standing. No reason
for this was apparent. During the first three days a high
proportion of marked leaves which were lost from bushes
could be observed uneaten, lying on the ground, and thus
were evidently broken off simply by the passage of the
sheep. These were removed. By the morning of the fourth
day the sheep were grazing normally.

However, no statistically-significant relationships could
be demonstrated at the end of the experiment, between
cell egesta accumulation and either of cell saltbush leaf
loss, or cell saltbush foliage biomass reduction. Even when
the two Highest-on cells were disregarded, no significant
trends could be detected from the remaining cells. This
was contrary to the results of at least two earlier
experiments, in which the relationships were significant.

From a general point of view, the outcome thus
appeared to be of an atypical grazing episode (Fig. 1) in
which flock behaviour was too aberrant for the expected
egesta deposition-saltbush defoliation relationships to be
expressed.

It was therefore remarkable to discover that in each cell
considered separately, the progressive accumulation of
egesta and the progressive removal of marked saltbush
leaves by the sheep were fairly closely and smoothly
related (Fig. 2). The further remarkable feature was that

![Figure 1](image-url)  
**Fig. 1.** The cumulative distribution of log₂ SIP (stocking intensity of the part) for the 20 parts of the sheep-
stocked saltbush enclosure. The right-hand scale expresses SIP variation in terms of PSI (paddock
average stocking intensity). By comparison with Hulder's
1964 data (see Fig. 1 of Lange 1985), note the atypically
low proportion of SIP > PSI.
the slopes of these relationships, i.e. egesta accumulated per tagged leaf taken—appeared to vary between cells in a very systematic way.

In this case the intercept is significant.
These results reveal an unsuspected quantitative interrelationship in block-browse plant interaction, which is too significant to dismiss without attention.

Fig. 2. Cumulative egesta accumulation versus cumulative loss of marked saltbush leaves for 3 representative cells from the enclosure. Note how slopes are steeper in cells that accumulated more egesta. Lines with less than 6 points involved days with no sheep visits.

That is shown in Fig. 3 for the eight non-camped cells, where these slopes are plotted against the total fresh weights of sheep egesta deposited on the cells over the six-day period. The equation of the linear regression is:

\[ y = -24 + 6.49x, \quad r^2 = 0.86, \quad p < 0.001, \]

where \( y \) = g egesta deposited per 1% tagged leaf removed (= slope), and \( x \) is kg egesta deposited. The intercept is not significant.

When the slopes are plotted against the natural logarithm of cell egesta accumulations, all ten cells including the camp-sites are accommodated in a very highly significant regression:

\[ y = -156 + 88.5 \ln (x), \quad r^2 = 0.92, \quad p < 0.001. \]

On face value, the results imply that as SIP rises, the systematic defoliation rate of the saltbush by the sheep falls.

Since marked leaves were observed lying detached upon the ground, during the early part of the six-day period, interpretation must allow for effects due to the mere passage of sheep, as well as direct browsing.

On general grounds, one might have thought that if there was to be an effect of this nature, then it might have increased not decreased the specific defoliation rate. That is, crowding as SIP increased might have been expected to increase incidental physical damage to saltbushes, thus removing more leaves per sheep, not less. But the reverse applied. Bush density did vary slightly from cell to cell, but not in any way that explained this effect.

The effect remains unexplained and serves as a reminder that little is yet understood of fine details at the grazing interface between sheep and saltbush. Since it is demonstrated so far only from this single experiment, it requires verification, and further trials will be undertaken.

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NEW RECORDS OF SPIDERS (ARACHNIDA: ARANEAE) FROM SOUTH AUSTRALIA

BY BERNARD GUERIN

Summary

The spider fauna of South Australia is largely unknown due to a lack of systematic collecting over the years. Few studies have been published and these are based on material collected incidentally to other groups. Thus the larger and wandering spiders are better known than cryptic and nocturnal species.