

DEPARTMENT OF AGRICULTURE AND FISHERIES, SOUTH AUSTRALIA

Agronomy Branch Report



A SKELETON WEED SURVEY

1976 - 1977

By G.M. Fromm,
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Report No. 101

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BACKGROUND:

The biological control agents, the Chondrilla rust fungus (Puccinia chondrillina), gall mite (Aceria chondrillae) and gall midge (Cystiphora schmidtii), were released in South Australia in late 1971 and early 1972 to help control skeleton weed (Chondrilla juncea).

Agronomy Branch Report No. 3 (December 1968) is a history of the spread of skeleton weed in South Australia from its first reported occurrence at Parilla on the 19th March, 1947, until September 1968. Since 1968 no assessment has been recorded by the Department of Agriculture and Fisheries of either the spread of the weed in the Murray Mallee or the effect that biological control has had on it. This report attempts to fill that gap.

THE AIMS OF THE SURVEY:

- (1) To determine the spread of the rust fungus, gall mite and gall midge in the Murray Mallee of South Australia.
- (2) To determine the effect of these biological control agents on skeleton weed populations in the Murray Mallee.
- (3) To record any change of agricultural practices in, and production from, this region (if an effect on the skeleton weed population was apparent).

THE SURVEY AREA:

- (1) An area south of Parilla (part of the Hundred of Bews, Parilla and Day, in the County of Chandos) was surveyed by E.S. Hogg in 1968 (Agronomy Branch Report No. 3). This district was resurveyed. (See Appendix I for map showing location of properties visited.)
- (2) The survey also included a random selection of farmers located in the southern parts of Counties Albert and Alfred and the major part of Counties Buccleuch and Chandos. (See Appendix II for map showing location of properties visited.)

SURVEY METHOD:

A questionnaire was drawn up (see Appendix III for questionnaire format) and all property owners visited were asked all questions on the questionnaire. An inspection of each property, with the property owner, was carried out so that the presence of the biological control agents could be checked and so the property owners' estimates of the density, and if practical, total area infested with skeleton weed could be assessed.

The summer of 1970/71 was selected for comparison with the summer of 1976/77. The predators were released in late 1971.

The names of owners of each section to be surveyed in the Parilla district were obtained from the District Councils of Lameroo and Pinnaroo. Property owners were sent a letter, in early January 1977, advising them of the survey and its aim. They were contacted again, by telephone, to arrange a suitable date and time for the visit. Sixteen property owners were visited in this district. Five properties in the original survey conducted by E.S. Hogg were not included in this survey because of either a very recent change of ownership or death of the previous owner. (See Appendix I for location of these five properties.)

The rest of the area surveyed was covered on the basis of one property per Hundred for the four Counties involved (see Appendix II). The properties were selected from a County map by selecting at random two section numbers from each Hundred. The owners of these two sections were then identified by us contacting the appropriate District Council Office. For the purposes of the survey, the property owner had to be resident on the property and had to have owned and farmed the property for at least seven years (i.e. since 1970), and preferably longer, so that all questions included in the survey could be answered. Two section numbers were selected so that at least one property owner met the above two requirements. Property owners were contacted, by telephone, to arrange a suitable date and time for the visit. Twenty-seven properties were visited in this part of the survey.

The survey was conducted between December, 1976 and April, 1977.

RESULTS OF THE SURVEY:

A. GENERAL OBSERVATIONS:

- (1) The rust fungus and gall midge were present on 43 properties surveyed. The majority of these properties were not original release sites for either or both of these biological control agents.
- (2) The gall mite was sited on only 14 of the 43 properties included in the survey (33 per cent). Eleven of these 14 properties were in the survey district south of Parilla. The remaining three properties on which the gall mite was present were original release sites for the mite. On one of these three properties the mite was present approximately 2 kilometres from the release site. On the other two properties it was present only within approximately 0.5 kilometres of the release site.
- (3) On three of the properties visited during the survey (7 per cent) an "off type" or different form of Chondrilla juncea was or had been present. On the property in the Hundred of Pinnaroo, County Chandos, a different form of skeleton weed had been present, but was eradicated. On the other two properties the infestation was still present. The outbreak on the property in the Hundred of Peake, County Buccleuch was approximately two square metres plus a few isolated plants nearby. The area was treated with Tordon (R) by the property owner before seed set. The outbreak on the property in the Hundred of Hooper, County Buccleuch covered approximately 10 hectares plus many isolated plants. The property owner did not attempt to eradicate this different form of skeleton weed because of the very light soil, which was prone to drift, and the cost of the chemical required to spray the area.

B. OBSERVATIONS OF PROPERTY OWNERS

- (1) Of the property owners, 72 per cent claimed that since the release of the biological control agents the total area of land infested with skeleton weed on their properties had either remained the same or increased. Only 28 per cent claimed that the area had decreased.
- (2) All property owners agreed that the distance between rosettes was greater now than in 1970 (the average distance quoted had doubled) i.e. the infestations were less dense. Many property owners had only small patches of what they classed as heavy infestations (densities quoted for heavy infestations ranged from rosettes touching to rosettes up to 90 cm apart). The remainder of the infestation on their property consisted of scattered plants or isolated small patches.
- (3) Of the property owners, 69 per cent claimed that the rosettes were smaller now than in 1970, 9 per cent claimed they were the same size, 16 per cent claimed they were larger and 7 per cent were not sure, or could not recall the size of the rosettes in 1970 for a comparison.
- (4) On 81 per cent of the properties visited the area of land cropped annually had not altered. On 19 per cent the area cropped had increased. Half of the properties that were sowing more crop were doing so because of skeleton weed suppression, and the other half were sowing more for economic reasons (e.g. good grain prices, low stock prices). Basic crop rotations had remained the same.
- (5) Of the property owners, 79 per cent claimed that crop yields on land infested with skeleton weed have increased since 1970. However, only 41 per cent of these property owners attributed this yield increase entirely to the suppression of skeleton weed by the biological control agents. The remaining farmers were of the opinion that a combination of several factors was responsible for the yield increase. The three factors most commonly mentioned, but not necessarily in the following order were:-
- (i) reduced vigor and density of skeleton weed.
 - (ii) improved soil fertility as a result of superphosphate applications and better legume pastures (the better legume pastures, either sown or natural re-establishment, could have occurred as a result of (i)).
 - (iii) the release of new improved cereal varieties more suited to the lighter soil types.
- (6) Of the property owners, 40 per cent had changed the crop species sown on skeleton weed infected land. The main change had been from rye to barley and in some cases from barley to wheat or oats. The factors, either singularly or in combination given for the change of species were:-
- (i) less problems with skeleton weed.
 - (ii) greater sandhill stability.
 - (iii) improved fertility.

However, 60 per cent of the farmers were still sowing the same species because of drift or low fertility.

- (7) Of property owners, 86 per cent seeded all of the paddock when it was due to be cropped while 14 per cent still avoided seeding some portions. These were generally the light sandy rises.
- (8) Only 12 per cent of property owners still used herbicides to suppress the skeleton weed in the cereal crop. The herbicide most commonly used was Amine, 2,4-D. In 1970 35 per cent of property owners sprayed specifically for skeleton weed suppression although many more used herbicides for general broadleaf weed control. Of the owners, 40 per cent had, at some stage, attempted to control skeleton weed by spot spraying.
- (9) Of property owners, 91 per cent claimed that the skeleton weed did not grow as tall or as vigorously in the crop since the release of the biological control agents.
- (10) Of property owners, 23 per cent still had problems at harvest and left patches of crop unharvested because of skeleton weed. This had been a greater problem in 1975 and 1976 because of the late finish to the growing season which reduced the effect of the rust fungus.
- (11) Of property owners, 37 per cent had tried nitrogenous fertilisers on land infested with skeleton weed. Only 14 per cent still intended to use them, but only on soils considered to be low in fertility. The two reasons given for their discontinued use were cost and the variable results obtained. The two main fertilisers used were urea and 3:1 or 2:1 superphosphate:ammonia mixtures.
- (12) Of property owners, 47 per cent had attempted to sow either annual or perennial pastures on land infested with skeleton weed. Of these, 80 per cent said it was now easier to establish the pastures.
- (13) Of property owners, 84 per cent agreed that the pasture composition had changed (annual grasses such as barley, rye and brome and some legumes such as the burr medic had re-established on areas previously only growing skeleton weed). Only 80 per cent however, claimed that the quantity and quality of pasture produced had improved since the suppression of the skeleton weed. The rest (20 per cent) claimed pasture production was the same or worse.
- (14) Of property owners, 40 per cent claimed that sandhill stability had improved since the release of the biological control agents. This, they claimed was a result of less digging for skeleton weed roots by sheep during the summer months. Fifty six per cent claimed sandhill stability has remained the same, while 4 per cent claimed that their sandhills were more likely to drift because of less ground cover.
- (15) Of property owners, 93 per cent claimed that stock numbers had either remained the same or increased. The reasons given by the remaining 7 per cent for the reduction in stock numbers were seasonal climatic conditions, the cost of restocking and poor pasture re-establishment on land previously heavily infested with skeleton weed.
- (16) All farmers agreed that they would like to see less skeleton weed although all agreed that, in an average year, they could live with the weed as it was then.

C. RESULTS OF THE SURVEY FOR THE PARILLA DISTRICT ONLY

The area of land not being cropped because of skeleton weed had decreased since 1968 when E.S. Hogg surveyed this area. In addition, the area of sown crop sprayed specifically for skeleton weed had also decreased. (See Appendix IV and V for maps showing areas of land affected in September, 1968 and 1976/77 respectively.)

D. GENERAL COMMENTS

The main limitation of the survey was the inability of some of the farmers to reliably remember the extent and density of the skeleton weed infestations on their properties prior to the release of the biological control agents in late 1971.

In addition to answers supplied by the property owners to the questionnaire, some general comments were made.

These included:

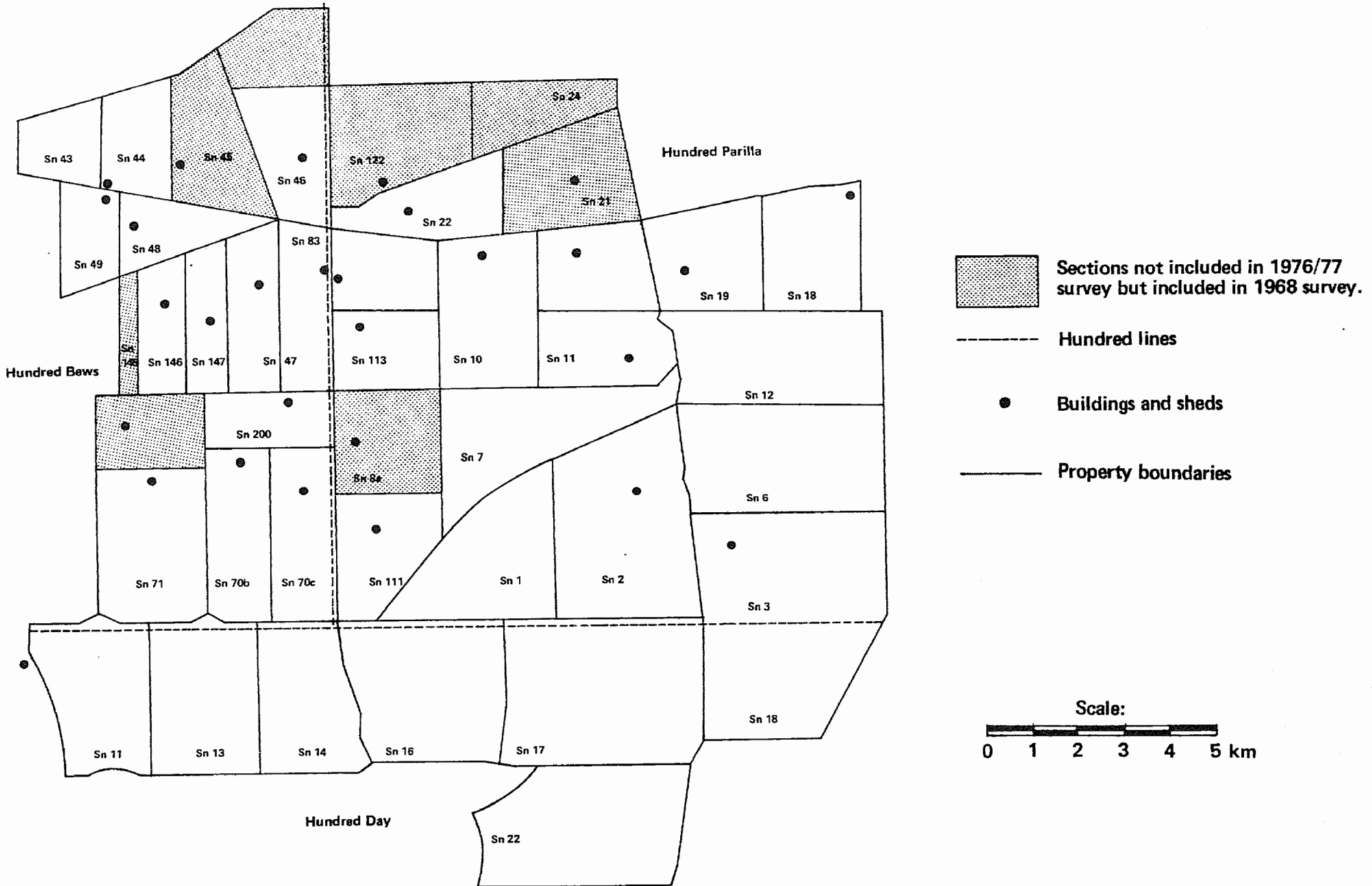
- (i) Skeleton weed becomes unpalatable to sheep once infected with the rust fungus.
- (ii) The skeleton weed plants dry off and become "woody" earlier now and thus the period during which they can be grazed is shorter.

Comments (i) and (ii) were not made by the same property owners.

- (iii) The effect of the rust fungus during 1975/76 summer and 1976/77 was very poor. Almost all property owners agreed that the skeleton weed had grown taller and set more seed in that year than in any of the previous years since the release of the rust fungus.

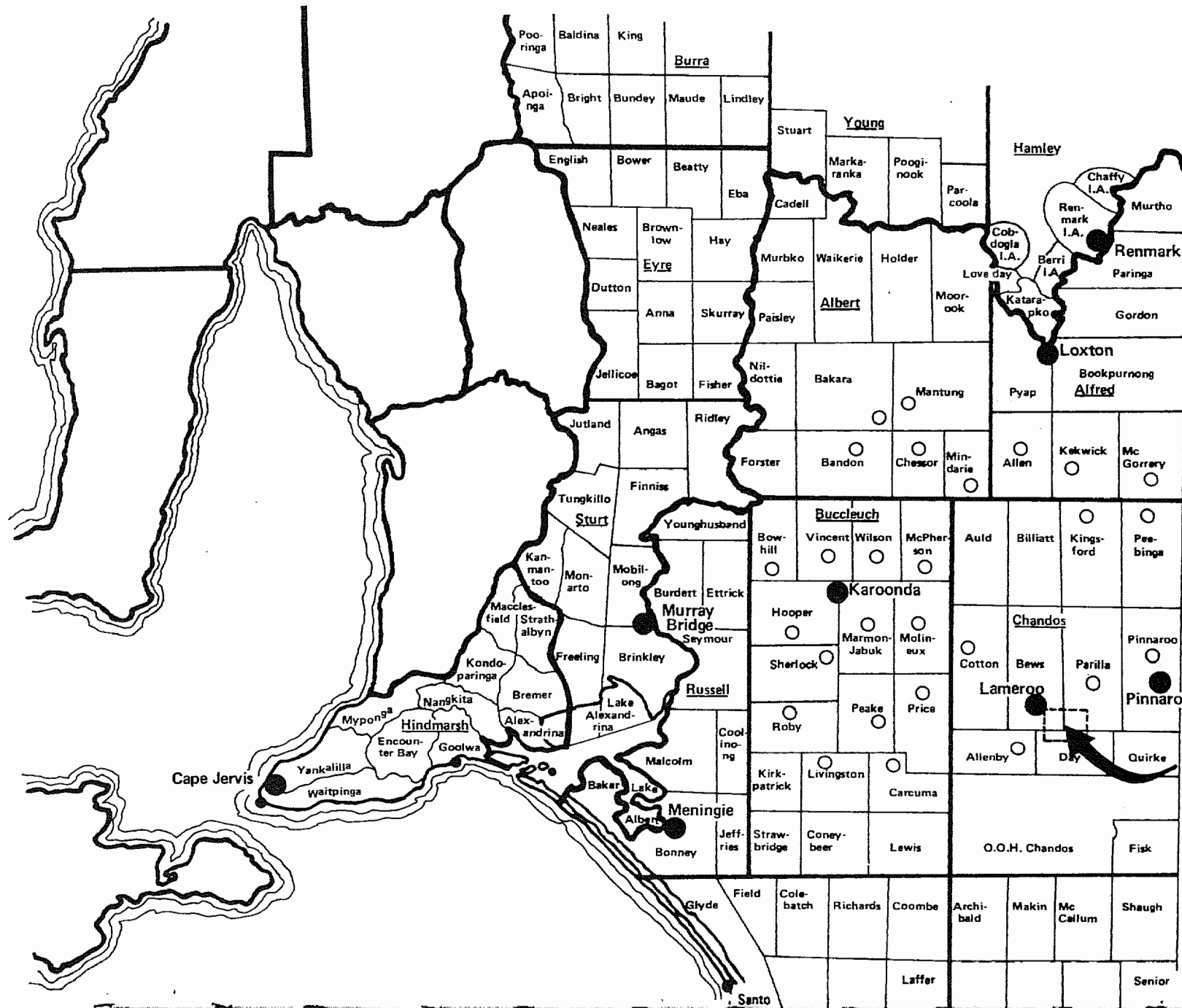
One point worth noting was that many (probably almost half, although no records were kept) of the property owners visited did not know if the gall midge and gall mite were present on their properties and, even if present, did not know what the visual signs of these biological control agents were.

Appendix I: Map of Parilla district Skeleton Weed Survey G.M. Fromm (1976/77)



Appendix II: Location of properties visited

Skeleton Weed Survey G.M. Fromm (1976/77)



○ Actual location of (27) properties visited.

See Appendix 1 for location of (16) properties visited in Parilla district.

APPENDIX III

QUESTIONNAIRE FORMAT

DEPARTMENT OF AGRICULTURE AND FISHERIES

SKELETON WEED SURVEY 1976/77

A. PROPERTY DETAILS:

- (a) Total area of property acres/hectares.
- (b) Area of property that can be cropped (i.e. arable)
..... acres/hectares.
- (c) Area of property heavily infested with skeleton weed prior
to release of the predators (1970) acres/hectares.
- (d) Area of property still heavily infested (1976/77) (Refer to
standard used in (c).) acres/hectares.

B. MAIN SOIL TYPES INFESTED WITH SKELETON WEED:

- (a) 1970
- (b) Now

C. DENSITY OF SKELETON WEED:

(Measured as distance between rosettes e.g. touching, 5 cm (2"), 10 cm (4"), apart etc.)

- (a) 1970
- (b) Now

D. VIGOR AND SIZE OF ROSETTES NOW COMPARED WITH 1970:

- (a) Same size
- (b) Smaller
- (c) Larger

E. HAVE ANY RUST RESISTANT OR "OFF-TYPES" OF SKELETON WEED BEEN NOTICED ON THE PROPERTY?

- (a) Yes
- (b) No

If "yes" give details e.g. size of area, when first noticed, treatment etc.

APPENDIX IIIF. PRESENCE OR NOT OF PREDATORS:

- (a) Rust - severe, minor, none.
- (b) Midge - many, few, none.
- (c) Mite - many, few, none.

G. IF THERE HAS BEEN AN EFFECT ON SKELETON WEED BY THE PREDATORS HOW HAS THIS AFFECTED -(1) Cropping Programme -

- (i) Area sown to crop acres/hectare. Has it -
 - (a) Increased.
 - (b) Decreased.
 - (c) Remained the same.

If (a) applies give reasons (e.g. previously heavily infested areas can now be sown, closer rotations, price of cereals).

If (b) or (c) applies give reasons (e.g. still too much skeleton weed, risk of soil erosion, land too run down or other reasons.)

- (ii) Crop Rotations -
 - (a) Have they changed?
 - (b) Remained the same?

Give reasons for change if any.

- (iii) Have crop yields, on areas infested with skeleton weed, as a general trend allowing for seasonal conditions, altered?
 - (a) Increased.
 - (b) Decreased.
 - (c) Remained the same.

Give details of any change (e.g. improved soil fertility, varieties etc.).

- (iv) Have crop species (e.g. wheat, oats, barley, rye) sown on skeleton weed infested areas changed?
 - (a) Yes.
 - (b) No.

Give details.

APPENDIX III

(v) Are there any areas still not being cropped because of skeleton weed?

YES NO

(vi) Spraying to suppress skeleton weed in crops -

(a) Did you ever spot spray for skeleton weed? YES NO

(b) Did you spray in 1970? YES NO

(c) Do you now? YES NO

Give details.

(vii) Where skeleton weed is still present in the crop -

(a) Does it grow as tall or as vigorously as in 1970?

YES NO

(b) Are there still harvesting problems? i.e. Do you still leave heavily infested patches?

YES NO

Give details.

(viii) Nitrogen fertilizers -

(a) Were they used in 1970? (or previous to that?)

YES NO

(b) Do you still use them? YES NO

Give details.

(2) Pasture Establishment And Production -

(i) Have you attempted to re-establish pastures on areas previously heavily infested with skeleton weed?

YES NO

What type of pasture?

(a) Annual (e.g. medics)

(b) Perennial (e.g. lucerne, primrose, veldt).

Give details of varieties, rates, methods used.

(ii) Has pasture establishment been easier and/or more successful?

Give details.

(iii) Effect on existing pastures -

(a) Has composition changed? YES NO

(b) Has quantity (bulk) or quality changed? YES NO

Give details.

APPENDIX III

(iv) Fertilizer usage -

(a) Are pastures topdressed? YES NO

Give details.

(b) Amount of fertilizer used in cropping phase.

Give details.

(c) Has fertilizer usage changed since 1970,
especially on those areas that were heavily
infested?

MORE LESS

Give details.

(v) Sandhill stability -

Has the area of land susceptible to soil erosion
changed because of skeleton weed suppression?

(a) Increased.

(b) Decreased.

(c) Remained the same.

Give details.

H. HAS CARRYING CAPACITY CHANGED?

i.e. total number of stock carried -

(a) Increased.

(b) Decreased.

Give details (e.g. skeleton weed suppression, change in cropping area
or rotation, improved pastures, low stock prices)I. DO YOU WISH TO SEE SKELETON WEED -

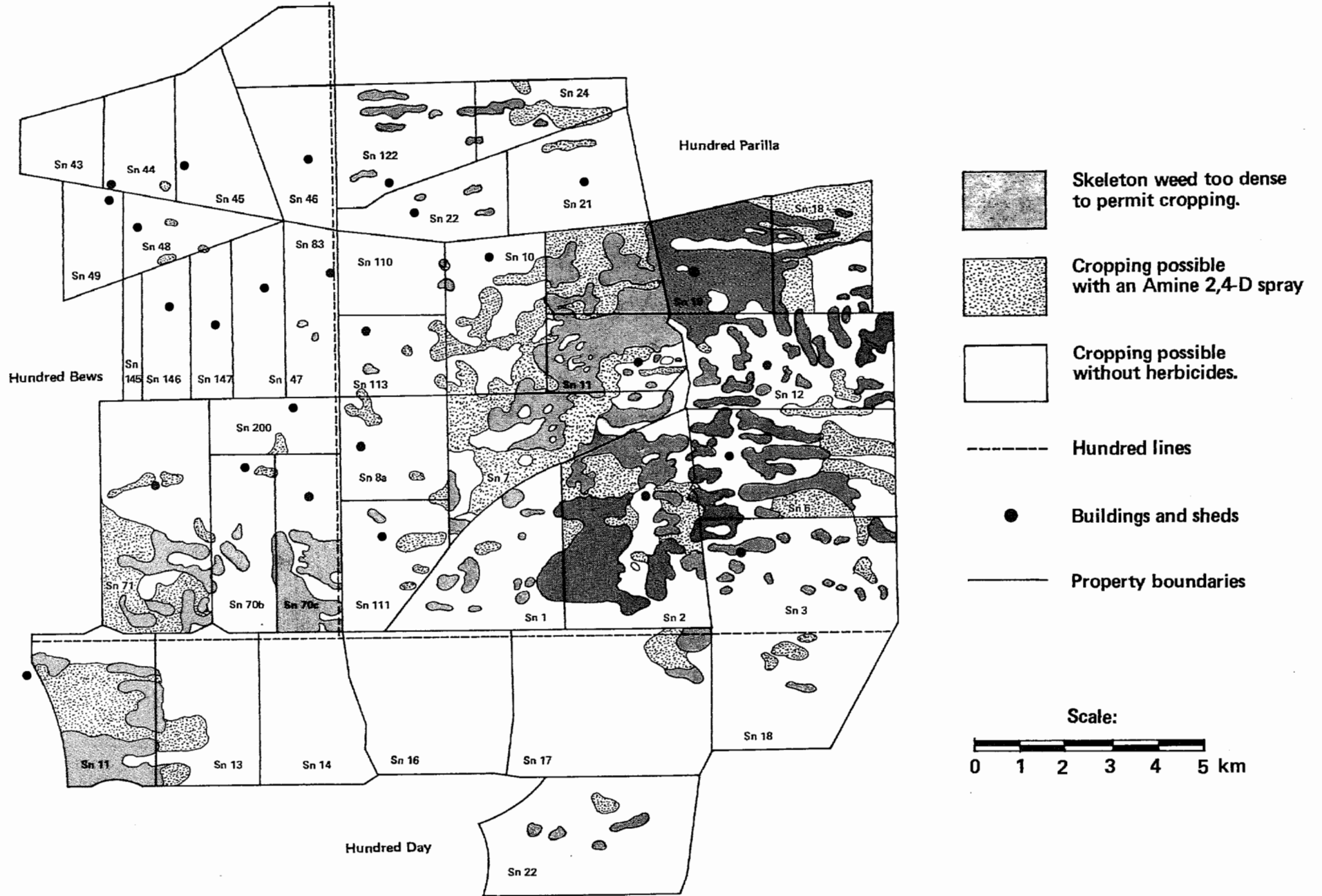
(a) Remain at the level it is now?

(b) Less than now?

(c) More than now?

Give reasons.

Appendix IV: Skeleton weed survey (1968) C.H. Johnson, Sn 2 Hd. Parilla, and surrounding properties.



Appendix V: Skeleton weed survey G.M. Fromm (1976/77)

