Control of Prairie Crawfish

A pasture heavily infested with crawfish.

AGRICULTURAL EXPERIMENT STATION
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Figure 1. Close-up view in a very heavily infested pasture.
CONTROL OF PRAIRIE CRAWFISH

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Area Infested
The prairie crawfish, (Cambarus hagenianus, Faxon) and its sub-species (Lyle 1937), occur in the northeast and central prairie of Mississippi. C. hagenianus also occurs in Alabama but its distribution and that of its sub-species are not known. The area most heavily infested in Mississipi is in Chickasaw, Monroe, Clay, Oktibbeha, Lowndes and Noxubee counties of the Northeast Prairie. The sub-species occurring in the Central Prairie is of very little economic importance.

The heavily infested land is of a heavy type soil with poor internal drainage. That most heavily infested is of a seepy nature which could not be classed as highly desirable for row crops. Small areas of a hundred square feet and up to an acre or two in rare cases may be almost completely bare of vegetation. These areas are heavily infested and the absence of vegetation is often attributed to "crawfish damage." The lack of desirable vegetation is due not only to the crawfish infestation but also to the presence of poor conditions for plant growth.

All of the land in the area is not infested. The infestation within an individual field may vary from practically none to a very heavy one, depending on the physical structure of the soil. The conditions most suitable appear to be lands which have a high water holding capacity and poor internal drainage and at the same time have excellent surface drainage.

Food.
The principle food of this crawfish appears to be vegetable matter, either alive or dead. Blades of grass are cut off as if by a pair of scissors (fig. 1), if the growth is tender. On older growth the leaves are ragged. Cotton plants just after they emerge are cut off just above the surface of the soil. The pest often gathers plant material and leaves a portion of it near the burrow entrance or, if the burrow is closed by the construction of a mud plug, parts of leaves and other debris may be found mixed with the mud.

Apparently the amount of food required is very small as individuals can live for long periods without any food under laboratory conditions.

Burrow Habits.
Excavations show that the burrows are almost vertical for the major portion of their course. A few burrows have been followed which were 10 to 12 feet in length. At the lower end of most burrows a small cavity is usually found which will hold about a quart of water. This cavity is called the crawfish's "silo" by some people in the infested area. Whether its primary purpose is for the storage of food is not known but it probably has some relation to the water requirements of the animal.

Within about 2 feet of the surface, branches off the main burrow often occur. In some instances an individual burrow may have as many as three or four openings. On cultivated land two openings with as little as a small bridge of soil an inch in diameter between them are not uncommon.

The heaviest infested land may have as many as 20,000 burrows per acre, but the usual infestation will be 8,000 to 15,000 per acre. It is very probable that the number of burrows that show evidence of recent crawfish activity is greater than the actual number of adult crawfish present. Such burrows during the spring months have a smooth, almost round opening, a slick appearance of the wall of the hole, and usually a small pile of mud adjoining the hole or nearby. However, under some conditions no mound is present. The opening of the burrow may be sealed. In some cases its presence may
be indicated by only a small elevation of the soil and the collection of debris on it. **Number of Crawfish in a Burrow.**

In the 100 or more burrows which were examined in detail by Lyle (1937) only one crawfish was found established to a burrow. That of course excludes the young in a burrow with a female. There is a possibility that two individuals may occupy a burrow while mating, but this is a pure conjecture since mating has not been observed in this species. Some other species are known to mate in the burrows.

**Surface Activity.**

Activity on the surface is very largely governed by rainfall. The largest numbers leave their burrows and crawl about on the soil surface on warm rainy nights and on nights following heavy rainfall when the water table is high. Surface activity on other nights is quite variable. As a general rule limited activity may be expected except when the water table is high or when it is raining. The frequency at which individual crawfish may come to the surface is not known but there is evidence which indicates that some individuals may remain in their burrows for long periods.

The most active period on an average appears to be during March and April. Most planters are of the opinion that crawfish damage decreases to such an extent by May that any crop planted at that time will not be seriously damaged. Suitable conditions have not been available to determine the activity during the dryer months. During these months the vegetative growth is such that the crawfish cannot be seen by the usual methods. However, destruction of the grass on small areas around the openings of the burrows makes it evident that restricted surface activity occurs at intervals during these dry months later in the season.

**Damage.**

As indicated previously, the native habitat of the prairie crawfish is the rolling lands used either for pasture or hay production. Under such conditions one of the principle objections is that the mounds “gum up” hay mower blades. Heavy infestations may cause a serious reduction in the amount of forage produced. Generally speaking 5000 to 6000 burrows per acre do not appear to be of very great economic importance. It is when efforts are made to improve pasture and hay lands that the lighter infestations are considered important.

When land use is changed from hay to row crops the damage usually assumes serious proportions. A partial or complete loss of stands from early planting is not uncommon in such cases.

**CONTROL**

Some of the earlier experiments, Lodbell (1912), consisted of testing a number of chemicals, tile drainage and dynamiting. Carbon disulphide (high life) was recommended. Later Lyle (1937) developed the use of coal tar creosote emulsion, the concentrate equivalent of which could be bought in the form of a stock dip. The latter control measure was by far the most satisfactory one that had been developed, especially from the standpoint of cost of materials. Its chief fault was that it was necessary to treat the burrows individually which made labor requirements excessive. Where only a few burrows are involved it is still probably as satisfactory as any control measure known.

With the advent of DDT it was found that this new material held promise for the control of pest crawfish.

**Insecticides Tested.**

Several of the newer organic insecticides were tested under both laboratory and field conditions. All of them have killed crawfish. However, from an overall consideration none has appeared to be superior to DDT. For that reason,
the urgency for a more satisfactory control measure and the shortness of the period during which work on control measures could be done DDT was used in the major portion of the tests.

"Bait" has been generally accepted as a term to designate the application of DDT by means of mixing it with some material such as cotton seed, cottonseed hulls or coarsely ground corn cobs. They may to some extent actually serve as a bait but such is not essential for the insecticide to be effective.

No consistent differences were found among the three materials as carrying agents for DDT. Sawdust was not sufficiently tested to determine whether it would be satisfactory. The many kinds of sawdust and its degree of decomposition would make recommendations for its use very difficult. At the present time several insecticides are being formulated as granular materials. DDT formulated as a granular material has been demonstrated as having properties which will kill crawfish. However, its effectiveness in comparison with other formulations has not been tested.

A bait that has proven satisfactory may be made as follows. This amount is sufficient for one acre.

1 1/2 bushels by volume of cottonseed hulls, cottonseed or coarsely ground corn cobs.

4 pounds of 50% DDT wettable powder.

1 1/2 gallons water.

The DDT wettable powder is first mixed with the water. The DDT settles out rapidly so the mixture should be stirred often. While constantly stirring the carrying agent slowly pour the DDT-water mixture on it. This is necessary in order to get a uniform distribution.

Baits may be applied broadcast or in bands 36 to 42 inches apart. Both methods of application have proven to be effective.

A DDT emulsifiable concentrate may be used instead of the wettable powder. In some tests the same amount of DDT from an emulsifiable concentrate has been more effective than from wettable powder. The exact relative effectiveness of the two has not been established. Because of the somewhat greater hazard encountered in the hand distribution of emulsion treated carrying agents, wettable powders are considered as being safer to handle where baits are likely to be used.

Although baits were previously accepted as the best means of control that had been developed they were not becoming popular because of the difficulty in mixing and distributing them. Sprays were tried using the litter on the ground as the carrying agent. In these tests practically all of the litter was destroyed on some plots. The results showed that the action of DDT was very largely contact since crawfish were killed on ground almost devoid of any vegetation.

Spray applications have consistently given control of 90% or better when 2 pounds of DDT per acre were applied. The spray should be made up as follows:

One gallon of 25% DDT emulsifiable concentrate is diluted with water to make enough emulsion to spray an acre. The amount of water used will be governed by the equipment with which the spray is applied.

Any type of low gallonage spray equipment may be used and airplane applications (Fig. 2) have proven satisfactory. It is very important that the insecticide be well distributed (Fig. 3) regardless of the type of equipment that is being used. Drift of spray should not be depended upon for coverage.

**Determining Degree of Control.**

Dead crawfish on the surface have a good psychological effect but they cannot be used as a measure of the effectiveness of an insecticide. Even if birds, etc. did
not influence the number of dead crawfish present, the mere fact that the grass and weeds would make it difficult to find them renders such evaluation of questionable value. Some of the experiments showed that control may be obtained without actually being able to find any great number of dead crawfish. The number of burrows which showed signs of having a live crawfish in them, for convenience called "active burrows," was used as a means of determining the population.

After several counts were made at intervals on the same plots it became obvious that the degree of control could not be determined the same year that the control measures were applied. The principal reasons for this were the very irregular surface activity of individual crawfish, the period of effectiveness of the insecticides, the difficulty experienced in finding the burrows after a period of dry weather, and the presence of increased vegetative growth. Consequently, the effectiveness of a control measure was based on the number of active burrows found the spring of the year following treatment.

**Timing Application of Control Measures.**

Observations by farmers and those who have worked experimentally established the fact that the greatest surface activity occurs on rainy nights and on nights following heavy rainfall. The application of control measures under such exacting conditions, although desirable, were not considered practical for the average farm conditions, neither was it practical under the conditions in which the experiments had to be conducted.

It is generally known that the greatest seasonal surface activity occurs during the spring months, being greatest during March and April. Other than restricting the application of control measures very largely to those months no other weather conditions were considered. As a matter of fact it was necessary for the surface of the soil to be dry in order to use experimental spray equipment with which most of the applications of sprays were made. This procedure has given the experimental control measures a very severe test.

**Period of Effectiveness.**

The very irregular surface activity of this species of crawfish makes it necessary that the insecticide have a long residual action. Checks of dying crawfish
on small treated areas showed that DDT was effective for four weeks or more. After larger treated areas became available for study observations indicated that it is effective for at least six weeks. These observations are in agreement with those of several farmers.

**Control on Cultivated Land.**

Control of crawfish on land that is to be converted from sod to row crops requires considerable planning if it is to be highly effective. The two most practical procedures are:

1. **Apply** the control measure during the spring previous to that in which the land is to be planted to row crops, or

2. **Prepare** the land during the fall and apply the control measure in the spring at least one month before any additional preparation of the soil is done for planting.

A fairly high degree of control has been obtained when baits were applied at planting time but the slow rate at which DDT kills the crawfish is such that considerable damage may be done before they are killed. The most effective protection of cotton was obtained when the control application was made well in advance of planting. A cloddy, rough surface reduces the effectiveness because the baits become less exposed.

Sufficient land has not been available to definitely establish the value of sprays on land after it has been prepared for planting. The tests that have been conducted indicate that equal amounts of DDT are more effective when used as baits than as sprays. Baits were certainly more effective than sprays when applied at planting time when the surface soil had been disturbed. Sprays applied after the winter rains had settled the soil were more effective than those applied af-

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Figure 3. Active crawfish burrows in the center of this picture resulted from incomplete coverage by spray plane.
ter the surface had been disturbed. All reports indicate that sprays are not as effective on plowed land as on sod except possibly when very favorable conditions for surface activity occur immediately after the applications are made.

**Control on Sod Land.**

Conditions for treating sod land are not as exacting as those for cultivated land. Sprays and baits have both proven equally effective. In either case thorough distribution of the insecticide is necessary. Vegetative growth a foot or less in height did not affect control as long as it was standing erect. Where heavy plant growth is matted over the surface, baits may be expected to give better control than sprays because more of the DDT will reach the ground surface where the crawfish are active. A granulated insecticide may prove effective under these conditions.

**Retreating.**

Retreating with the same amount of DDT the second year has not proved practical. The most practical procedure has been to apply enough insecticide in the first application during the favorable season to effect a high degree of control. Actual eradication was not accomplished even by applying DDT at a rate of two pounds per acre for two successive seasons. Some previous work by Lyle (1937) showed that some crawfish may not come to the surface for several months.

**Reinfestation.**

The time required for the development of satisfactory control measures and the sizes of the areas treated have not permitted the collecting of data on the rate of reinfestation. However, the experiences of those who have farmed "crawfishy" land and observations of a few isolated cases indicate that the infestation on sod land will probably build up to a level of economic importance in about five years. Reinfestation on land kept in cultivation will occur only around the edges of the field and such infestations usually do not constitute a serious problem.

**Weeds.**

On hay land where crawfish are controlled the growth of weeds usually becomes a problem. This of course varies under different conditions but may be of such a nature that some alteration in management may be necessary in order to produce the maximum amount of high quality hay.

**SUMMARY**

The prairie crawfish infests certain upland soils in an area of Mississippi and Alabama known as the "prairie". It is primarily vegetarian in its feeding habits. Production of forage is reduced particularly during the spring months and the mounds, when wet, gum up mower blades and thus hamper mowing operations. The establishment of improved pastures is made more difficult by its presence, and where it occurs on land used for row crops it reduces the stand and may even completely destroy early plantings.

DDT is effective for its control. It may be applied either as a bait or a spray. Two pounds per acre have given satisfactory control under varied conditions. DDT is more effective on well settled than freshly plowed soil. Baits appear to be more effective on freshly plowed soil than sprays. The surface of the ground should not be disturbed for at least one month after the insecticide is applied. Thorough coverage is necessary to give satisfactory control. March and April are favorable months for the applications of the insecticide.

**Previous Work Referred To:**
