

Project Title: Behavioral Studies of the Southern and Tawny Mole Cricket

Principal Investigators:

R. L. Brandenburg (North Carolina State University)

M. G. Villani (NYSAES/Cornell University)

Project Description: The goals of this project are to:

1) isolate and determine the activity of sex, aggregation and alarm pheromones of the tawny mole cricket (TMC). 2) improve our understanding of TMC and southern mole cricket (SMC) behavior as affected by environmental conditions. 3) determine the impact of biological and chemical control agents on mole cricket behavior.

Funding for MGV (Cornell University) was put in place 10/30/95

Project Progress Year 2:

1a. Isolation of Tawny Mole Cricket Sex Pheromone: Previous studies funded by USGA suggested the possible existence of a sex attractant in tawny mole crickets. This information has not been published in the scientific literature to date. To explore this possibility tawny mole cricket adults and nymphs were collected in North Carolina and transported to the NYSAES, Geneva, New York for laboratory analysis. At the present time we are collecting airborne samples of isolated virgin male, virgin female, mated male and mated female tawny mole crickets to determine if specific compounds are being released into the air that causes attraction in crickets of the opposite sex. If active crude pheromones are detected through behavioral and electroantennogram assays then active fractionation and synthesis will proceed through the winter and spring of 1996. Field testing is anticipated in North Carolina during the fall of 1996.

1b. Biological activity of alarm pheromone in southern mole cricket: It was noted in Year 1 progress report that when disturbed, both mole cricket species discharged a oily, highly odorous substance from their abdomen. Discharges were collected for biological and chemical assays in our laboratory. A small discharge sample from each cricket species was prepared for analysis through the use of gas chromatography. There were also clear differences in the SMC & TMC discharges indicating unique compound constituents in the discharges for these two species. During the second year radiographic bioassays were conducted that indicated that tawny mole crickets would avoid southern mole cricket discharged incorporated into soil. Radiographic studies also determined that when two highly predacious southern mole crickets were placed in large soil arenas they would space themselves in the arenas to allow no contact between them. This further suggests a chemically mediated alarm or identification pheromone that reduces chance encounters in complex soil systems thereby reducing aggression between conspecific predators. Continued research will focus on the isolation & identification of these compounds.

2. Effect of the soil environment on mole cricket behavior: Extensive studies outlined in the previous progress report detailed the typical foraging behavior of tawny mole crickets and host finding behavior of the southern mole cricket. We suggested that the "Y" shaped burrow of the tawny mole cricket aided in predation avoidance and water and temperature regulation. Studies in 1995 focused on the impact of soil stratification and compaction on mole cricket construction. These studies indicated that soil texture and stratification can significantly modify tunnel construction, thereby impacting on the ability of these mole crickets to escape adverse environmental conditions. These studies will be continued and expanded during 1996.

3. Impact of biological and chemical control agents on mole cricket behavior: Field studies conducted during 1995 by RLB suggested that biological and chemical insecticides may alter the behavior of mole crickets thereby affecting the performance of these agents in the field. Preliminary radiographic assays with one synthetic insecticide suggests that tawny mole crickets can sense and avoid high concentrations of the product in soil thereby reducing overall activity. Radiographic experimental designs where crickets could not escape insecticide suggested a decline in burrow construction and maintenance. This work although interesting must be expanded and verified in 1996. Additional studies on the effects of fungal pathogens and entomogenous nematodes are in progress and will be continued during 1996.

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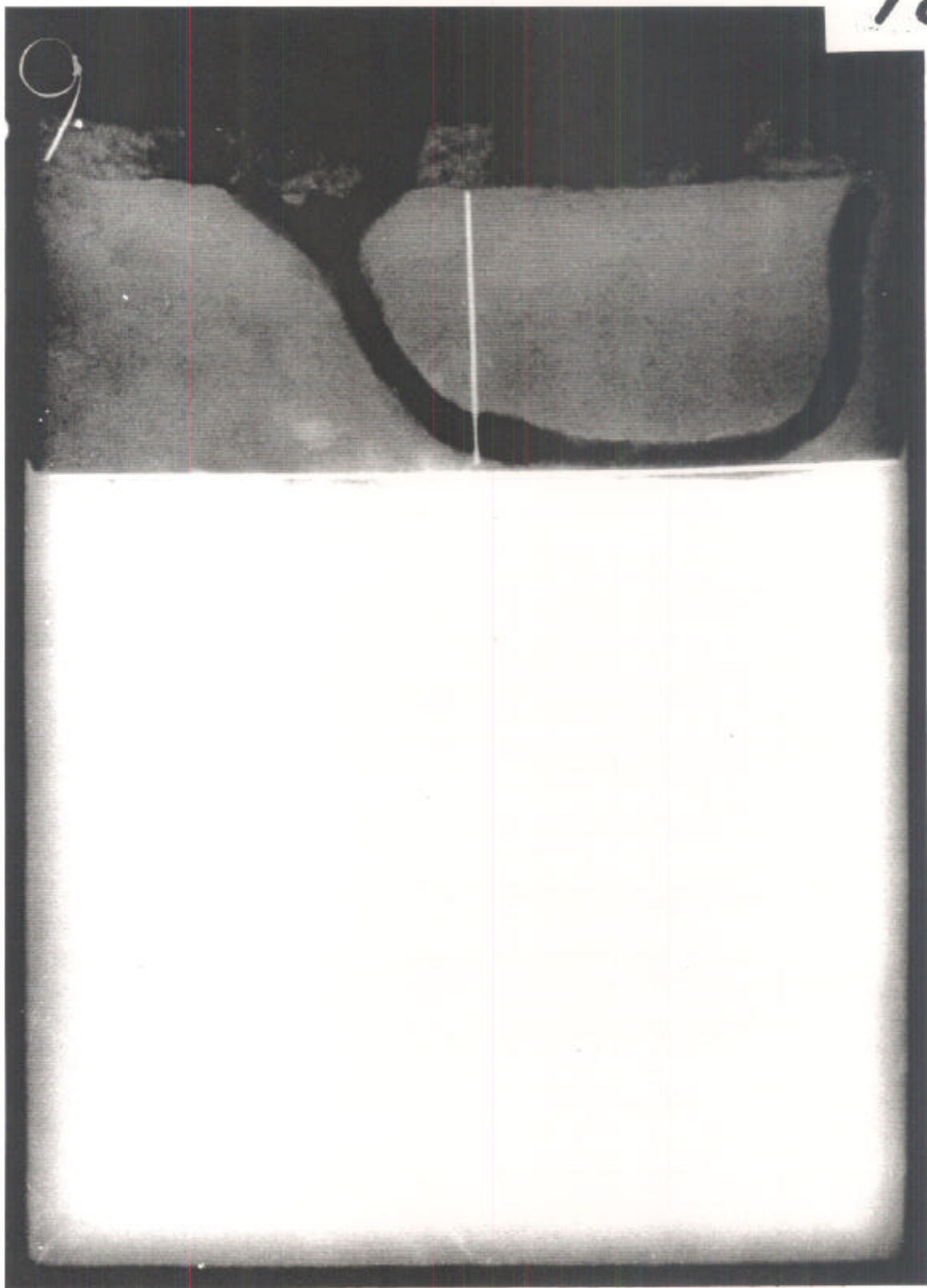
Figure 1a, b

Soil in radiographic arenas was stratified with the lower section of the arenas containing a more fine textured soil. In both examples tawny mole crickets altered their high stereotypic tunnelling behavior ("Y" with extended tunnel doen into profile) to a truncated "Y" with deflection at interface. Such changes may impact response to environmetal changes in field..

Figure 2a, b

Soil in radiographic arenas was stratified with the lower section of the arenas containing a more fine textured soil. In these two arenas however a synthetic insecticide was incorporated into the upper left-hand quadrant of each arena. The radiographs clearly indicate that: 1. the crickets are avoiding the soil containing insecticide; 2. both crickets were alive in these arenas after several days suggesting that this avoidance impacts insecticide efficacy; 3. the crickets are able to burrow into the lower soil section if the proper stimuli is provided.

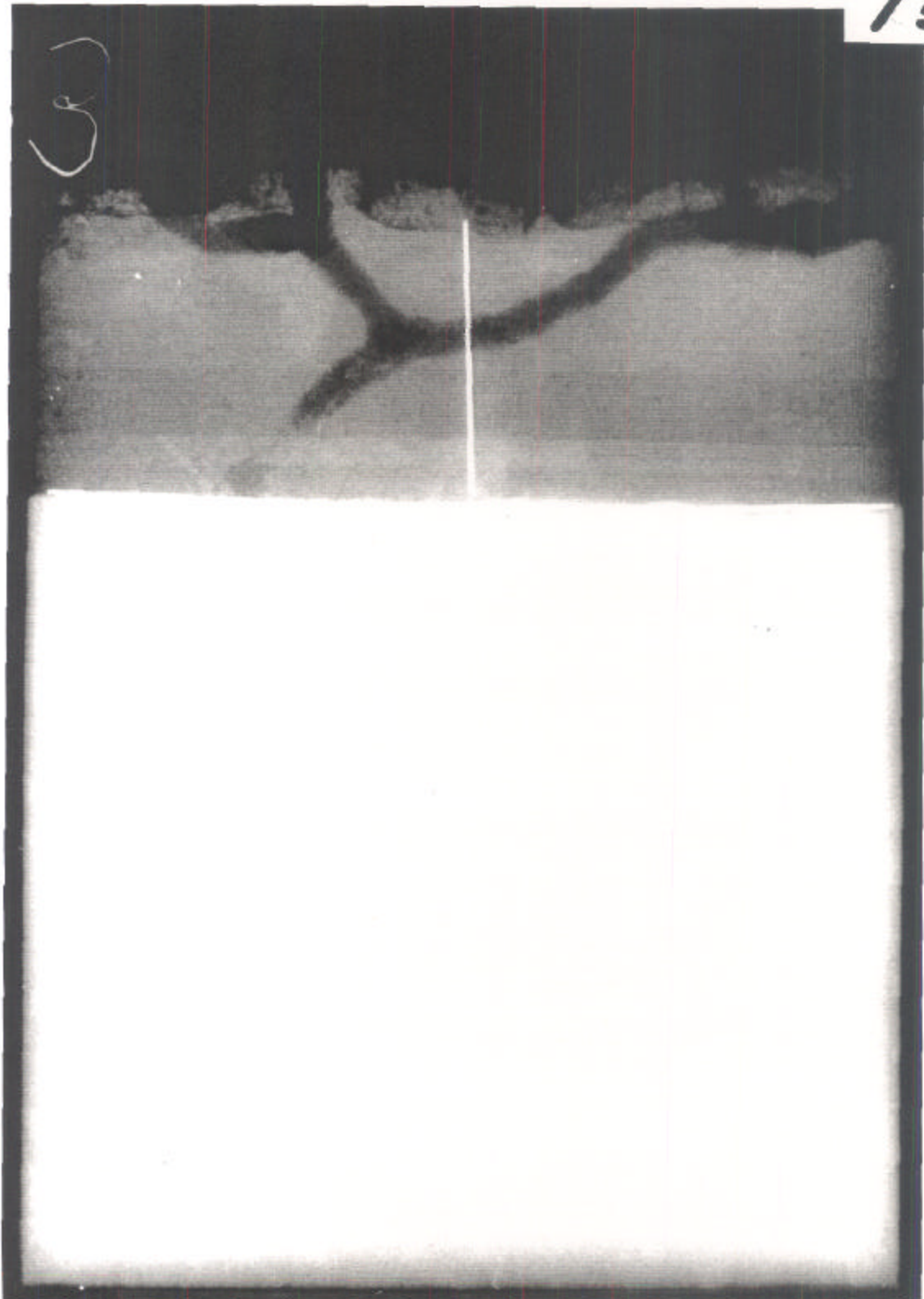
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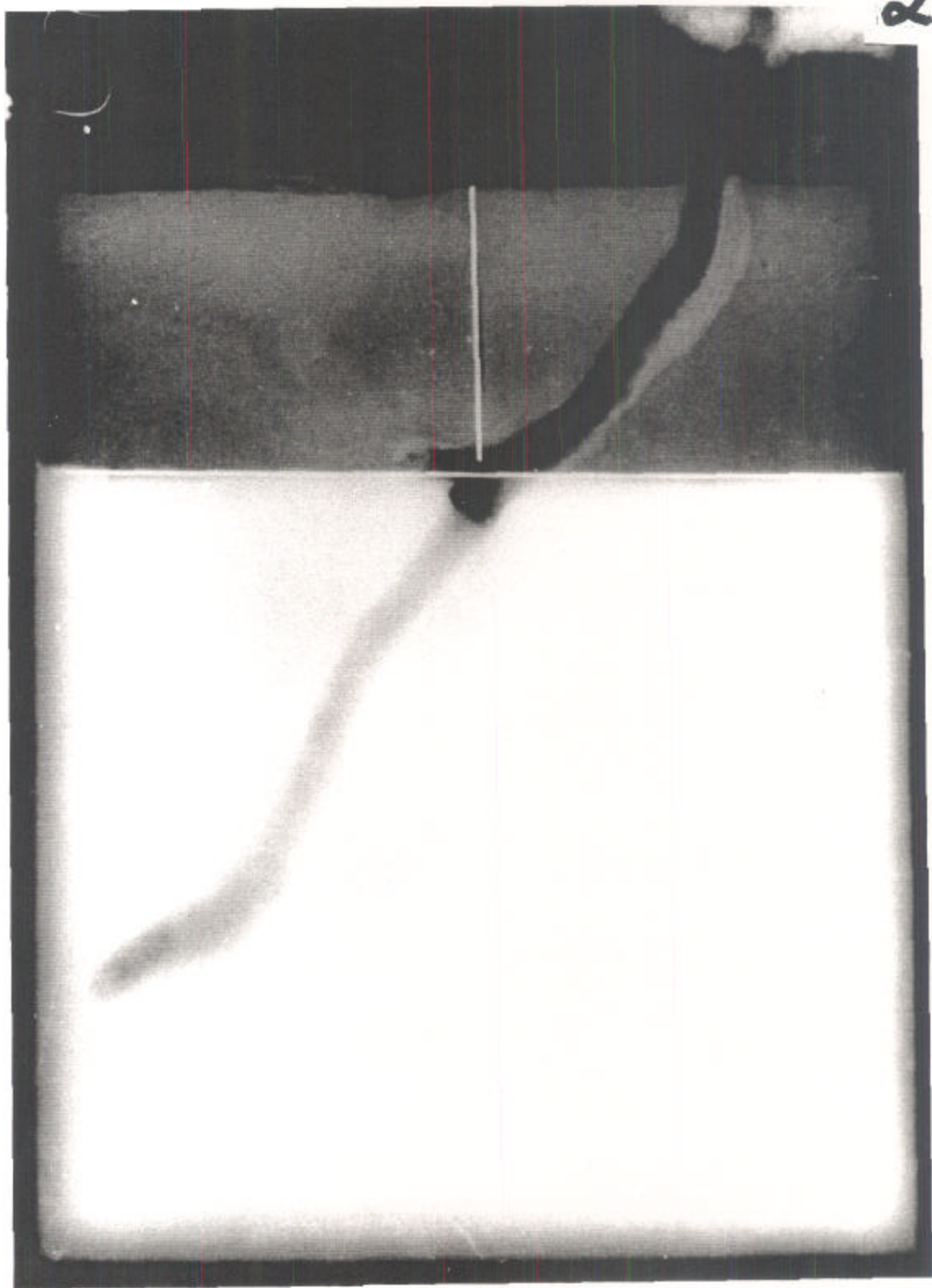
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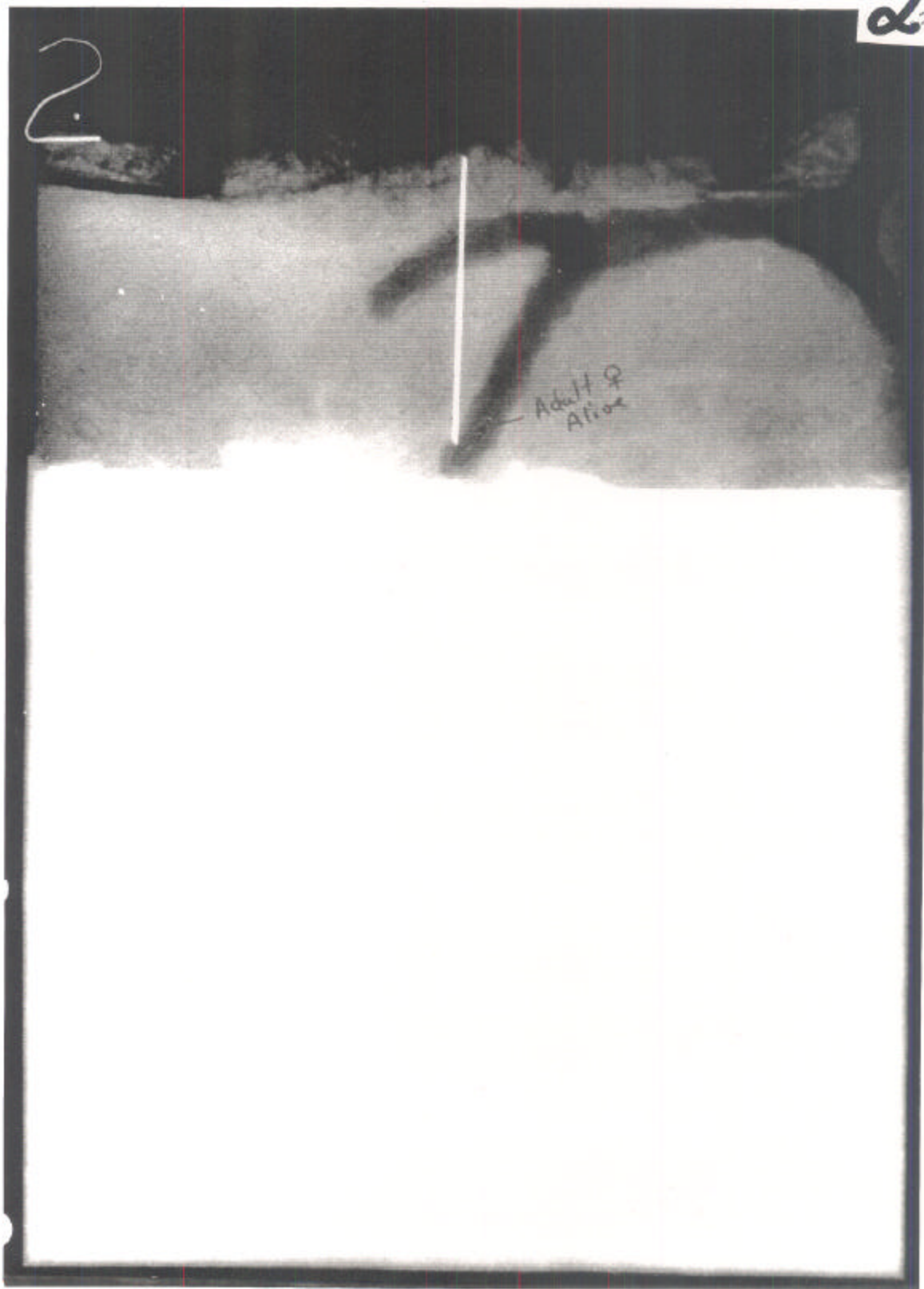
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2a



00013

2b



00014