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# VERTEBRATE DAMAGE CONTROL RESEARCH IN AGRICULTURE

# INVESTIGACIONES SOBRE EL CONTROL DE DAÑOS CAUSADOS POR LOS VERTEBRADOS EN LA AGRICULTURA

1973 ANNUAL REPORT
INFORME ANUAL 1973

PALMIRA, COLOMBIA
RESEARCH CENTER
CENTRO DE INVESTIGACIONES

Cooperating Agencies
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INSTITUTO COLOMBIANO AGROPECUARIO

Office of Agriculture and Fisheries
Bureau of Technical Assistance
U.S. Agency for International Development

Denver Wildlife Research Center
Bureau of Sport Fisheries and Wildlife
U.S. Department of Interior

Fig. 1. Paul Woronecki and Danilo Valencia explaining dove-banding techniques to Oswaldo Martinez from Uruguay.

# CALI, COLOMBIA, FIELD STATION
# 1973 ANNUAL PROGRESS REPORT*


PRINCIPAL INVESTIGATORS:

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James M. Ramakka and Vicky F. Ramakka***


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Instituto Colombiano Agropecuario

Nicaragua -

Banco Nacional de Nicaragua

United States -

Agency for International Development
Bureau of Sport Fisheries and Wildlife
Denver Wildlife Research Center
(Work Unit DF-104.2)

*Results Incomplete and Not for Publication, Release, or Use Without Authority of the Director, Denver Wildlife Research Center.

** Dr. Sequeira and Mr. Bojorge are with the Banco Nacional de Nicaragua and are not on the field station staff.
Dr. Vogel, formerly with the Banco Nacional de Nicaragua is now with the Rice Research Center in Sierre Leone, Africa.

*** Peace Corps Volunteers attached to the Instituto Colombiano Agropecuario, Palmira.

ABSTRACT*

The major objectives outlined in the study plan on the problem of rodent damage to coconuts were completed. Excellent control was achieved with an anticoagulant (diphacinone) bait. One paper on this work was published in Bogota by ICA and another manuscript was submitted to the PANS Journal in London, England, for publication. The results of these works were well received in Colombia.

A high population of cane-rats (Zygodontomys brevicauda) caused serious economic damage to cultivated crops in an area near Unguia, Colombia, during 1972 and early 1973 but this "ratada" vanished naturally from the area by April 1973.

The eared dove (Zenaida auriculata) has not caused serious agricultural problems in the Cauca Valley this year. Fewer hectares of soybeans were planted and only small populations of eared doves were in the area at planting.

Sorghum growers in the Valley experienced only light and isolated damage from doves but after harvest large concentrations of birds were observed feeding in the harvested fields.

Plans to spray ripening seed-sorghum with Methiocarb to test its effectiveness as a repellent for eared doves did not materialize.

The effectiveness of Methiocarb (DRC-736) as a soybean seed repellent for eared doves was field tested and observations indicated good repellency, but a qualitative and quantitative evaluation is needed. Very little progress has been made on developing a damage appraisal technique for emergent soybeans. Treating soybean seeds with Methiocarb does not affect germination or production. More studies have to be conducted to determine how certain types of dove damage to soybeans affect plant survival, growth, and yields.

While studying the life history of the eared dove, data have been gathered on parasites, diseases, food habits, and breeding season. An aging and sexing technique has been developed and over 60 food items have been isolated.

Work was begun on shiny cowbird (Molothrus bonariensis) food habits and biological studies.

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* This research was conducted with funds provided to the Bureau of Sport Fisheries and Wildlife by the Agency for International Development under the proejct "Control of Vertebrate Pests: Rats, Bats, and Noxious Birds," PASA RA (ID) 1-67.

Only scattered reports were received of bird damage to rice in the Llanos of Colombia, possibly caused by dickcissels (Spiza americana).

A Vampire Bat Control Workshop and Seminar was conducted in Valledupar, Department of Cesar, Colombia.

Dr. Oswaldo Martinez of the Ministry of Livestock and Agriculture in Uruguay spent 3 weeks at our station under the AID Participants Program.

Work on rodent and bird damage to rice in Nicaragua was much reduced this year as a result of the devastating earthquake which destroyed Managua in late 1972.

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# INTRODUCTION

## Objectives

The objectives of the program are to conduct research aimed at developing safe, effective, and economical methods of reducing crop losses caused by birds and mammals, and to develop Latin American capabilities in the field. Colombia was selected as the station site because of its central location in Central and South America.

## Program

Dr. Luis H. Camacho, Colombian Director of this project, returned in July following a year of sabbatical leave in Nigeria, Africa.

Jose Fernando Londono completed his studies for the degree of Master of Science at the University of California at Davis in December and will return to the project in January 1974. These studies were carried out under the auspices of the USAID Participant Training Program.

Project personnel assisted in the presentation of a Vampire Bat Control Workshop in Valledupar, Colombia.

Dr. Oswaldo Martinez from the Ministry of Agriculture, Uruguay, spent 3 weeks at the station for training with regard to control of eared dove damage to agriculture under the auspices of the USAID Participant Training Program.

Dr. G. Clay Mitchell visited the project twice during the year for the purpose of planning and presenting a Vampire Bat Control Workshop.

Mr. Donald Mott (DWRC) visited the station in April to discuss the eared dove work and coordinate plans for Dr. Martinez' visit and proposed field work in Uruguay.

Mr. Edmond Shuart (USAID/Washington) was in Colombia in February to discuss project plans and activities.

Mr. John De Grazio (DWRC) visited the project in August to coordinate research plans for 1974.

Peace Corps Volunteers, James and Vicky Ramakka, were assigned to the project by ICA in April. They are carrying out the investigations on the biology of the eared dove.

Miss Carmenza Gutierrez entered on duty as project secretary on September 4, 1973.

## RESEARCH ACTIVITIES - COLOMBIA

### Investigations of the Extent and Economic Importance of Vertebrate Damage to Agricultural Crops in Colombia

#### Introduction

A summary of vertebrate damage in Colombian agriculture was presented in the 1970, 1971, and 1972 Annual Reports. Whenever possible, station personnel investigated reports of damage to delineate the problems and to determine where research should be directed. Tables 1 and 2 list additional reports of vertebrate damage.

#### Procedures

Inquiries were made of most reported problems and follow-up information was requested. The information received determined if an investigation was justified.

#### Results and Discussion

The following items still appeared to be the most serious problems in Colombia and research has been concentrated in these areas.

Several mammalian species are reported to cause agricultural problems. Rats (*Rattus rattus*) damaging coconuts is considered the most serious problem, but a control method has been found. Reports of other serious rat-damage problems in rice and other crops have been reported and some investigated.

The eared dove (*Zenaida auriculata*) has been considered the most serious bird pest in Colombia, especially in the Cauca Valley, but also in other South American countries. During the past 3 years, damage to soybeans and sorghum in the Cauca Valley appeared less severe. One possible explanation is reduced soybean acreage. Or, crops may be less vulnerable due to altered agricultural practices. Finally, the eared dove may be at a population low due to natural fluctuation or adjustment to changing environmental conditions. The anticipated increase in soybean planting in 1973 did not materialize and the eared dove damage was not serious.

The dickcissel is another serious agricultural pest in many countries of Central and South America. The bird is migratory and causes seasonal, sporadic, and irregular damage.

Both dickcissel and eared dove problems continue to warrant investigation in Colombia and other Latin American countries.

Table 1. Location of additional mammal damage to agricultural crops in Colombia, 1973

| Location | State | Common Name | | Family | Crop and Stage | Time |
|---|---|---|---|---|---|---|
| | | English | Spanish | | | |
| Acacias | Meta | Mice | Ratones | Rodentidae | Corn, plantain | All year |
| Villavicencio | Meta | Mice | Ratones | Rodentidae | Corn, rice | June to August<br>February to March |
| Villavicencio | Meta | Dogs | Perros | Canidae | Corn, cattle | All year (cattle) |
| Restrepo | Meta | Rats | Ratas | Rodentidae | Corn, plaintain, fruit | Seasonal (corn)<br>All year (others) |
| Restrepo | Meta | Fox | Zorros | Canidae | Poultry | All year |
| Restrepo | Meta | Oppossum | Chucha | Didelphidae | Poultry | All year |
| Fuente de Oro | Meta | Guinea Pigs | Curi | Rodentidae | Corn, sorghum, maturing rice | All year |
| Fuente de Oro | Meta | Rats | Ratas | Rodentidae | Corn, sorghum, maturing rice | All year |
| Granada | Meta | Guinea Pigs | Curi | Rodentidae | Rice | May to August |
| Granada | Meta | Mice | Ratones | Rodentidae | Rice | May to August |
| Several towns | Bolivar | Rats | Ratas | Rodentidae | Rice, corn, sesame, cassava | All year |
| Near Pasto | Narino | Vampire Bats | Vampiros | Desmodontidae | Cattle | July to October |
| Unguia* | Choco | Cane Rats | Ratas | Rodentidae (*Zygodontomys brevicauda*) | All crops | All year |

* Reported last year.

Table 2. Location of additional bird damage to agricultural crops in Colombia, 1973

| Location | State | Common Name | | Family | Crop and Stage | Time Observations |
|---|---|---|---|---|---|---|
| | | English | Spanish | | | |
| Villavicencio | Meta | | Toches sabaneros | | Corn, rice | June-Aug-Feb-March—migratory all year, knocking over. |
| | | Doves | Las negras<br>Torcazas<br>Garzas<br>Caicas | Columbidae | Rice | May-Oct—making nests in rice. |
| Rice zone | Meta | Ducks | Patos | Anatidae | Rice (germination) | Seasonal, eating emerging plants. |
| Puerto Lopez | Meta | Purple Gallinule | Caicas | Rallidae | Rice | Apr-July-Aug—making nests in rice. |
| Caucasia | Antioquia | Woodpecker<br>Parakeets | Carpinteros<br>Periquitos | Picidae<br>Psittacidae | Cacao, mature | Seasonal, making holes in the fruits. |
| San Luis de Cubarral | Meta | Doves | Palomas<br>Cochas tolus<br>Mirlas | Columbidae | Corn at planting<br>Corn<br>Rice and sorghum<br>Planting and maturing | <br>May-August<br><br>February-July |
| Buenaventura | Valle | Swallows | Golondrinas | Hirundinidae | Wood (storage) | Aug—droppings on the wood. |
| Cali | Valle | Bee Martins | | | Bees | Seasonal |

Table 2. - Continued

| Location | State | Common Name | | Family | Crop and Stage | Time Observations |
|---|---|---|---|---|---|---|
| | | English | Spanish | | | |
| San Martin | Meta | | Mirlas | | Rice and sorghum Planting and maturing | February and July |
| Carimagua (Llanos) | Meta | Oriole Blackbird (*Gymnomystay mexicanus*) | Toche de Pantano | Icteridae | Rice, maturing | February-March |
| | | Red-breasted Blackbird (*Leistes militaris*) | Sargento | | | Seasonal |
| | | Seedeaters (*Sporophila* sp.) | Chisgas | Fringillidae | | Seasonal |
| Bogota | C/marca | Summer Tanager (*Piranga rubra*) | Cardenales | Thraupidae | Bees | November-December |

## Control of Rodent Damage in Coconuts

### Introduction

Results of earlier surveys (see 1972 report) revealed that rodent damage to coconuts in Colombian plantations ranged from light (4%) to very heavy (77.5%). The latter, on San Andres Island, accounts for monetary losses estimated to be in the neighborhood of U.S. $1,000,000 annually. A locally available anticoagulant rodenticide was chosen for testing.

### Procedures

A previously selected coconut plantation on San Andres Island was treated with the anticoagulant rodenticide, Diphacinone, at a 0.005% concentration in bait form. The bait was enclosed in sealed plastic bags, each containing approximately 75 g. The prepared bait product used in this trial is commercially available in Colombia under the trade name "Ramik" (Velsicol Colombia)[1]. Approximately 250 bait bags were placed in the crowns (Figs. 2 and 3) of palms (one bag per palm) and another 100 were placed at the base of the trunk of palms not treated in the crowns. Three weeks following treatment, another damage survey, conducted exactly as the original, was initiated. The purpose of the 3-week delay was to allow sufficient time for the anticoagulant to be effective and also to allow time for coconuts damaged before treatment to fall so their presence would not introduce a bias into the posttreatment survey results. Periodic checks were made during the following months at which time damaged palms and those immediately adjacent were retreated.

### Results and Discussion

The results of this trial indicate that Diphacinone bait is highly effective in controlling damage in coconuts. The pretreatment survey had shown losses in excess of 75%; the posttreatment damage survey revealed <u>no damage</u>. No damage was noted during periodic checks for at least 2.5 months following treatment. Subsequently, only occasional damage was encountered and treatment, as described, effectively controlled it. The bait bags placed at the base of the trunks were much less effective than those in the crowns, suggesting treatment of the crowns as the preferable method.

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[1] Reference to trade names does not imply Government endorsement of commercial products.

Fig. 2. The rodents pass from one palm to another by way of overlapping fronds, without needing to come down to the ground. It is therefore necessary to place the bait in the crown of the tree.

Fig. 3. The rodenticide bait bag situated in the axis of a leaf in the crown of the palm.

Results of these investigations were published by ICA and another manuscript was submitted to the PANS Journal, London. In addition, several Colombian newspapers and agriculturally oriented publications have mentioned the study and/or published parts or all of the reports they obtained from the ICA office in Bogota. The ICA publication was widely distributed throughout Colombia and well received. ICA plans to publish an English version of the same publication specifically for distribution on San Andres Island where the indigenous population speak English.

## Investigation of the Extent and Economic Importance of Other Rodent Problems in Colombia

### Introduction

During the last 6 months of 1972, the area near Unguia, Colombia, had experienced a severe "ratata" (devastation of cultivated fields by field rodents). These rodents have destroyed crops such as maize, rice, and yuca, and are causing social and economic problems for the inhabitants of the region.

Unguia is located in the Darien of Colombia near Panama, at the mouth of the Atrato River in the Gulf of Uraba (Atlantic Ocean) at about 8° N latitude and 77° W longitude. This is a humid zone of partly inundated lowlands, but the high areas are inhabited by 25,000 persons practicing traditional agriculture.

Because of the restriction on cattle-raising in this area (currently a natural barrier for foot-and-mouth disease), the residents are forced to produce more cultivated crops. The trend has been to clear and plant small plots (2 hectares) maintained by cutting and burning. There is very little vegetation or weed control during the crop-growing season. This may have caused the recent "ratada" and the less severe rat problems during the preceding years. Recent losses due to rats have caused loan companies to discontinue financial aid until a satisfactory control program is established by the government.

Not only are large quantities of agricultural crops being destroyed, but rats have been reported invading homes, a potential health problem.

### Procedures

A trip was made to the area in January; animals were trapped to determine the involved species, and areas experiencing damage were visited.

## Results and Discussion

The visit substantiated reports of a serious rat problem to maize plantings as well as other local crops. Trap successes of 50% and 30% (24 traps for 2 days of trapping revealed a very high population of cane rats (*Zygodontomys brevicauda*) in a maize field. All captured adult females were pregnant or lactating.

Another visit to the area and field tests were planned but not executed because the "ratada" vanished from the area in April. Similar experiences with this species have been described by Hershkovitz (1962).

The incidence of other similar problems in Colombia and other Latin American countries should be investigated.

## Vampire Bat Control Training in Colombia

### Introduction

Vampire bats are carriers of paralytic rabies. Recently, new chemical techniques have been developed to reduce vampire bat populations (Mitchell, 1973). Workshops have been conducted in Nicaragua, Panama, Brazil, and in Colombia to quickly teach these new control methods. A seminar was conducted in Colombia between July 31 and August 4 covering vampire bat control methods and trypanosomiasis, rabies, and plant intoxication. There were 45 participants.

### Objectives

The objectives of the workshops were to discuss and demonstrate field methods to reduce vampire bat populations. Both topical and systemic control methods were demonstrated.

### Workshop in Colombia

Rabies is a major problem in low, warm parts of Colombia, especially in the northern part of the country. Valledupar, Department of Cesar, was selected as the site of the workshop because this region was suffering from a rabies outbreak. The seminar was conducted by G. Clay Mitchell and Paul P. Woronecki, BSFW/AID, Cali, Colombia, who covered vampire bat control methods; Dr. Indalecio Rodriguez, Managua, Nicaragua, who covered Derrengue (a plant intoxication which produces symptoms in cattle that are very similar to rabies); Dr. Stuart McConnell, Texas A&M, who covered rabies and rabies vaccines; and Dr. John Wyss, Texas A&M, who covered trypanosomiasis.

The field demonstrations using Diphenadione were held at ranches near San Juan del Cesar, Department of Guajira. Vampires were captured and treated topically at one ranch (south of San Juan) while cattle were treated systemically at another (Las Mercedes).

In addition to the formal discussions and demonstrations, the workshop included informal meetings with cattlemen in San Juan del Cesar and Valledupar. In San Juan over 200 attended the program and 20 attended in Valledupar.

An excellent presentation on control of vampire bats was given by Dr. Horacio Delgado, Ministry of Agriculture, Center of Veterinary Investigations, Maracay, Venezuela. Venezuela has a regional campaign based on these new control methods.

Fig. 4. Clay Mitchell showing a vampire bat captured near San Juan del Cesar to the seminar participants.

Three cattle dying with symptoms of rabies were observed during the seminar.

## Results

Topically treating vampire bats with Diphenadione.--On August 1, five vampires were captured, treated, and released. Although we made no pretreatment or posttreatment evaluations, the ranch personnel reported satisfactory results.

The vampires affecting this ranch lived in water wells. The problem might also have been solved by covering these wells securely after the bats had left at night, thus encouraging them to emigrate.

Systemically treating cattle with Diphenadione.--The control of vampire bats resulting from this demonstration were neither excellent nor spectacular. At the Las Mercedes Ranch northeast of San Juan (Table 3), the biting incidence was only slightly reduced.

Excellent results were probably not obtained because 10 cattle in the affected area were not treated, pointing out the importance of treating all cattle in the area.

A followup demonstration was conducted at the same ranch on December 13. Once again, all the animals in the affected area could not be corralled for treating, and although the posttreatment evaluation conducted on December 28 was satisfactory, it would probably have been better if all animals had been treated (Table 4).

Table 3. Results from Finca Las Mercedes, San Juan del Cesar, Colombia (Seminar Demonstration) where cattle were treated with diphenadione (systemic method).

| | August 2, 1973 | August 13, 1973 |
|---|---|---|
| No. of cattle checked for fresh bites | 26 | 30 |
| No. of fresh bites | 67 | 32 |
| No. of cattle treated with diphenadione | 26 | - |
| Reduction in fresh bites (%) | - | 52 |

Table 4. Results from Finca Las Mercedes, San Juan del Cesar, Colombia (Follow-up Demonstration) where cattle were re-treated with diphenadione (Systemic method).

| | December 6 1973 | December 13 1973 | December 28 1973 |
|---|---|---|---|
| No. of cattle on the ranch | 276 | 180 | |
| No. of cattle in affected area | | 180 | |
| No. of cattle checked for fresh bites | 68 | 94 | 100 |
| No. of animals with fresh bites | 28 | 46 | 12 |
| No. of fresh bites | 38 | 85 | 12 |
| No. of cattle treated with diphenadione | | 94 | |
| Reduction in fresh bites/animal after control | | | |
| Percent of animal bitten | 41.2% | 48.9% | 12.0% |

## Control of Eared Dove Damage in the Cauca Valley

### Introduction

The eared dove is reported to cause serious agricultural damage in Argentina, Uruguay, and Trinidad, as well as in Colombia. In many countries, however, this dove is prized for sport and for food (Olivares, 1970; Johnson, 1967). The population in the Cauca Valley still attracts both local and foreign hunters, while requests for population reduction are being received from growers.

The dove problem in the Cauca Valley was reported serious during 1969 and 1970 after a buildup in severity during the previous 5 years. The seriousness of agricultural problems has declined in the past 3 years. CVC, Inderena, and others with hunting interests have expressed some recent concern about the population.

In 1972 the effectiveness of Methiocarb (DRC-736) as a soybean seed repellent for eared doves was field tested, but the results were inconclusive.

Soybean seeds treated with Methiocarb were tested for germination and survival. The treatment seemed to enhance germination but slightly reduced the plant survival rate.

Simulated dove damage studies indicate that certain types of damage may not affect plant density but may effect plant yields. Based on an experimental planting near Palmira, Thompson and Agudelo (1969) showed that treatment of soybean seed with DRC-736 may have effectively reduced eared dove damage to emerging soybeans.

## Population and Damage

### Procedures

Data was accumulated by field observations, reports, and collections throughout the Department of Valle.

### Results and Discussion

During the first 3 months of 1973, Colombia suffered the worst drought in its history, and agricultural crops worth millions of pesos were lost. During the arid period (March and early part of April), few doves were seen in the Cauca Valley, and soybean growers experienced little damage.

It rained in April, however, and we sighted either local or migratory movements of various birds, including ground doves, seedeaters, cattle egrets, cowbirds, swallows, and some doves. During the latter part of April, several hundred eared doves damaged an experimental sorghum planting on the ICA farm and later fed in harvested rice on the farm.

By late July (when the first large flocks of doves were observed in the Cauca Valley) harvest was well underway, and again there was little crop damage. At this time, the doves prefer feeding in areas already harvested.

During the latter part of September, large numbers of doves were seen on and near the ICA station. These birds were attracted to several large sorghum and corn fields which were harvested earlier that month. On various occasions we observed concentrations of several hundred to a thousand doves entering and leaving a harvested sorghum field at the eastern edge of the ICA farm. The number of doves gradually decreased during the early part of October, apparently caused by the frequent rains which caused sprouting of the spilled grain. Doves were also observed during October, causing some damage to standing sorghum at the CIAT station.

During late October and early November, doves (approximately 100 to 300) were observed on the ICA station feeding in harvested fields.

Bad weather in the mountains made it impossible to locate any concentrations of doves in these areas. Large concentrations of eared doves were observed during November and December near Palmira, Rio Frio, and Santander de Quilichao, but none were observed causing damage.

In November a major flyway was located in the mountains east of Palmira in the canyon of the Rio Amaime. This is our first observation of a concentration of birds from that area. More than 1,000 birds were flying daily from this canyon to CIAT and were feeding on harvested rice and sorghum. Most of these doves arrived at the feeding areas during mid and late morning and most of them began to return by mid-afternoon. In addition, small groups of doves were observed leaving and returning to the canyon from early morning until late afternoon (these may be nesting birds). The birds from the Amaime Canyon were flying at least 20 km to feed.

During the latter part of October, subadults made up approximately 50% of the doves collected. Of 19 doves collected from one flock of 200, 13 were subadults. This may indicate that the doves gather in flocks of predominately subadult birds. More evidence is needed to determine this with certainty.

During early November, only 7% of the doves collected were immature or subadults.

CVC expressed concern for the diminishing number of doves in the northern part of the Cauca Valley (reports received from hunters). They suspected that control programs have caused the decline. We doubt this, however, since we have not heard of, conducted, or witnessed any intensive control programs in that area. We do feel, however, that the number of conspicuous doves in the area has declined in the past 3 years.

## Food Habits and Biology

### Introduction

Knowledge of the natural history and food habits of a pest species is important in carrying out damage control programs in this and other countries. The information gained might also aid in the understanding and management of such species as a natural resource. Hence, a study was designed with the following objectives: (1) to determine the food items in the diet of the eared dove; (2) to determine its nesting seasons as indicated by changes in reproductive condition; (3) to determine what diseases and parasites infect the dove; and (4) to determine the ecological and economical significance of this species in the Cauca Valley.

### Procedures

Eared doves were collected, their crops and esophagi contents examined and saved for later identification and analysis, internal organs examined, parasites collected, blood samples taken, reproductive state noted (Fig. 5), etc. Field observations of breeding and nesting behavior were also made.

### Results

Food habits.--Four hundred fifty doves were collected for food habits studies. To avoid bias, birds collected in agricultural fields with standing or freshly harvested crops were not used. Data were analyzed by the aggregate volume method (Martin et al., 1946) and by percent frequency of occurrence.

Of the 450 doves collected for food habits, 62 had empty crops, 36 had crops containing less than 0.1 cc, 4 were unhealthy, and 1 crop was destroyed by shot, leaving 347 crops for analysis.

Average volume of food consumed per bird, excluding grit, was 2.4 cc (Table 5). The highest volume recorded was 13.8 cc and consisted entirely of rice.

Fig. 5. James Ramakka collecting biological samples from eared doves for parasite identification.

Table 5. Items eaten by eared doves expressed in percent aggregate volume and percent frequency of occurance.

| | MAY | | JUNE | | JULY | | AUGUST | | SEPTEMBER | | OCTOBER | | NOVEMBER | | DECEMBER | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of Birds | 58 | | 40 | | 36 | | 42 | | 42 | | 59 | | 36 | | 34 | | 347 | |
| Av. Vol./bird | 2.9 cc | | 2.8 cc | | 1.5 cc | | 2.4 cc | | 1.8 cc | | 2.0 cc | | 3.7 cc | | 2.4 cc | | 2.4 cc | |
| Agr. Crops | Vol | Freq | Vol | Freq | Vol | Freq | Vol | Freq | Vol | Freq | Vol | Freq | Vol | Freq | Vol | Freq | Vol | Freq |
| Rice | 48.3 | 56.9 | 1.7 | 5.0 | — | — | — | — | 0.4 | 2.4 | 3.3 | 8.5 | 56.3 | 36.1 | 59.2 | 44.1 | 24.9 | 19.9 |
| Corn | 44.8 | 41.4 | 40.5 | 47.5 | 58.5 | 52.8 | 19.0 | 38.1 | 46.7 | 54.8 | 68.9 | 69.5 | 23.1 | 38.9 | 20.7 | 29.4 | 39.8 | 47.8 |
| Sorghum | 4.3 | 15.1 | 17.5 | 22.5 | 22.4 | 33.3 | 62.2 | 69.0 | 46.6 | 54.8 | 17.8 | 16.9 | 13.7 | 33.3 | 16.2 | 26.5 | 22.5 | 32.6 |
| Soybean | — | — | 14.6 | 22.5 | 8.0 | 22.2 | 4.5 | 7.1 | 1.9 | 7.1 | 0.1 | 1.7 | 1.4 | 11.1 | 1.2 | 5.9 | 3.5 | 8.6 |
| Adzuki bean | — | — | 10.6 | 15.0 | 4.7 | 8.3 | — | — | — | — | 0.2 | 1.7 | — | — | — | — | 0.2 | 1.4 |
| Soybean (cotyledons) | — | — | — | — | — | — | — | — | — | — | 1.0 | 3.4 | 0.1 | 5.6 | 0.1 | 2.9 | 1.7 | 2.9 |
| Total | 97.4 | 94.8 | 84.9 | 90.0 | 93.6 | 88.9 | 85.7 | 88.1 | 95.6 | 92.8 | 91.3 | 89.8 | 94.6 | 97.2 | 97.4 | 91.2 | 92.6 | 91.6 |
| Weed Seeds | 2.2 | 70.7 | 14.9 | 85.0 | 6.4 | 72.2 | 13.0 | 81.0 | 2.7 | 54.8 | 8.0 | 76.2 | 4.9 | 69.4 | 0.1 | 35.3 | 6.6 | 69.2 |
| Misc. Material | 0.4 | 27.6 | 0.2 | 30.0 | trac | 16.7 | 1.3 | 42.8 | 1.7 | 35.7 | 0.7 | 22.0 | 0.5 | 11.1 | 2.5 | 38.2 | 0.8 | 28.0 |
| Grit* | — | 62.1 | — | 50.0 | — | 50.0 | — | 42.8 | — | 57.1 | — | 71.2 | — | 55.6 | — | 44.1 | — | 55.6 |

* Not included in aggregate volume.

Fig. 6. Wings of eared doves; immature (left) and adult (right).

Seeds of cultivated crops made up the bulk of the doves' diet, with corn most frequent in occurrence and aggregate volume (Table 5). While weed seeds (representing 14 plant families, 38 species, and 23 items yet to be identified) occurred in a majority of the crops, these seeds actually constituted only a small proportion of the total volume. The majority of weed seeds eaten were of the Euphorbiaceae, Gramineae, and Leguminosae families.

Our field observations indicate that doves do not damage standing corn and seldom damage standing rice. They prefer to feed on spilled grain in harvested fields.

Miscellaneous material eaten by the doves consisted of small snails (Gastropoda) and centipede or millipede segments (Arthropoda). Manure and soil occurred infrequently, but with volumes up to 2.0 cc. Other items included animal hair, an insect part, paper, bone fragments, plant parts, and calcareous shells from eggs and mollusks.

Life history studies.--Each dove was weighed. Age and sex was determined by internal inspection (Table 6). Testes length or ovary diameter and development of the crop glands were noted. Birds were classed in three age groups: Immatures, recently fledged dove with light fringed juvenile plumage; subadults, birds retaining a few light fringed coverts but otherwise similar to adults; and adults (Fig. 6).

A technique for aging and sexing eared doves by external characteristics was developed and will be submitted for publication.

Reproductive cycles.--Examinations and observations of eared doves indicate that a large proportion of them breed between July and September and between November and December (Figs. 7 and 8). It appears that subadult females do not enter a reproductive state until December (Fig. 9).

Nesting eared doves may exhibit a daily activity similar to white-winged doves (*Zenaida asiatica*). According to Cottom and Trefethen (1968), the breeding male white-winged dove leaves the nesting areas during the early morning and returns by mid-morning at which time the nesting female leaves. After the female returns at mid-afternoon, the male again leaves to return before sunset.

Observations of the eared doves' daily activity patterns are quite similar. There is a feeding period early in the morning, followed by a prolonged return flight by mid-morning and a large return flight to the mountains in mid-afternoon.

Observations indicate that the majority of the eared doves in the Valley nest in the mountains but fly down to the Valley to feed.

Table 6. Eared doves collected for food habits and other studies in 1973.

| MONTH | ADULT MALES | SUB ADULT MALES | IMMATURE MALES | ADULT FEMALES | SUB ADULT FEMALES | IMMATURE FEMALES | TOTAL |
|---|---|---|---|---|---|---|---|
| May | 23 | 12 | 3 | 17 | 9 | 3 | 67 |
| June | 22 | 7 | 2 | 16 | 2 | 0 | 49 |
| July | 23 | 5 | 0 | 12 | 2 | 2 | 44 |
| August* | 31 | 0 | 3 | 31 | 0 | 2 | 67 |
| September | 24 | 2 | 1 | 24 | 2 | 1 | 54 |
| October | 19 | 6 | 3 | 21 | 14 | 2 | 65 |
| November | 28 | 3 | 0 | 21 | 0 | 0 | 52 |
| December | 16 | 5 | 1 | 24 | 7 | 1 | 54 |
| Totals | 186 | 40 | 13 | 166 | 36 | 11 | 452 |

* Includes 15 hunter-killed birds not used for food habits. An additional 21 hunter-killed birds examined on August 17 were used for food habits but are not included here.

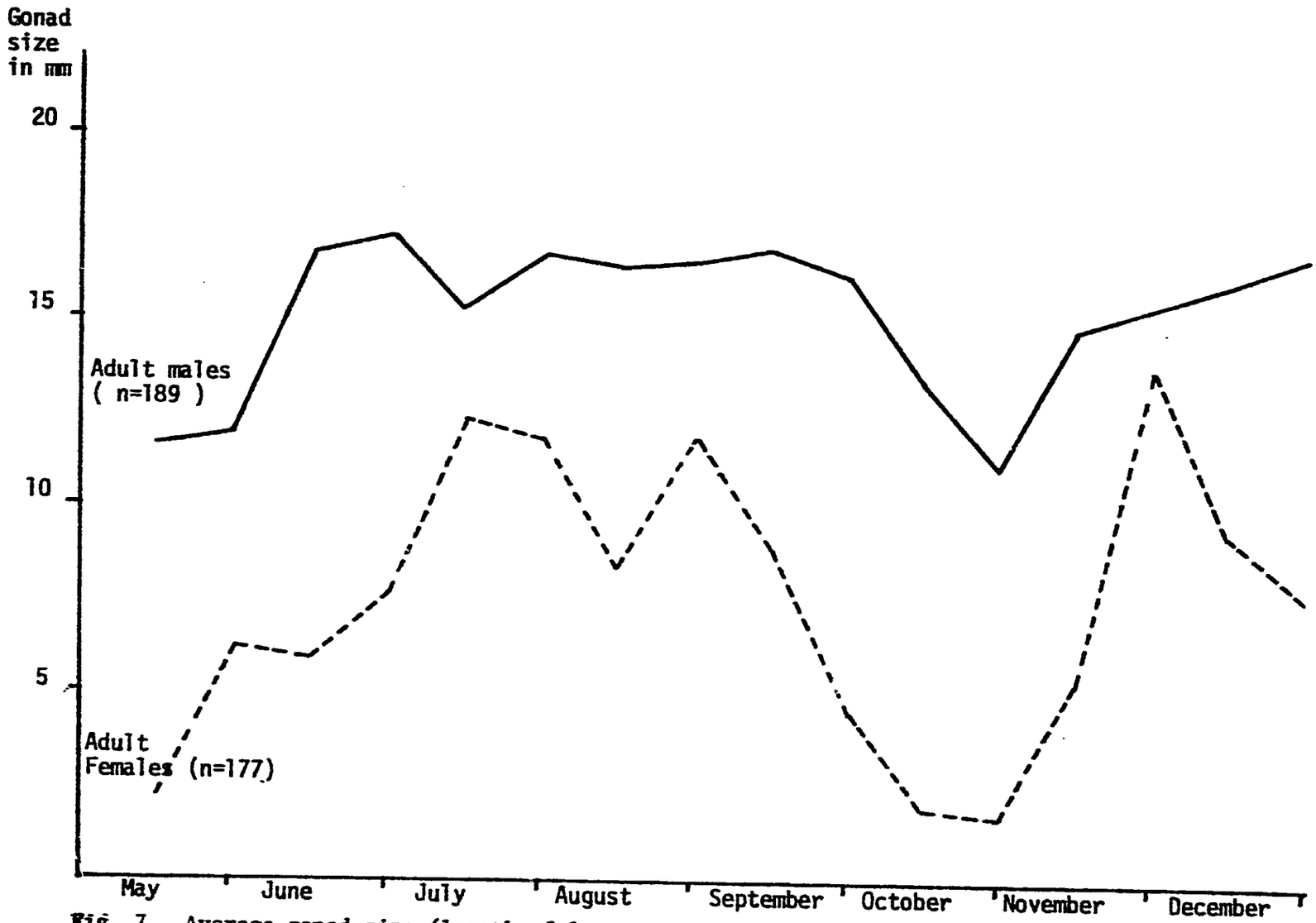


Fig. 7. Average gonad size (length of longest testis, diameter of largest ovary) of 361 adult eared doves by half month periods.

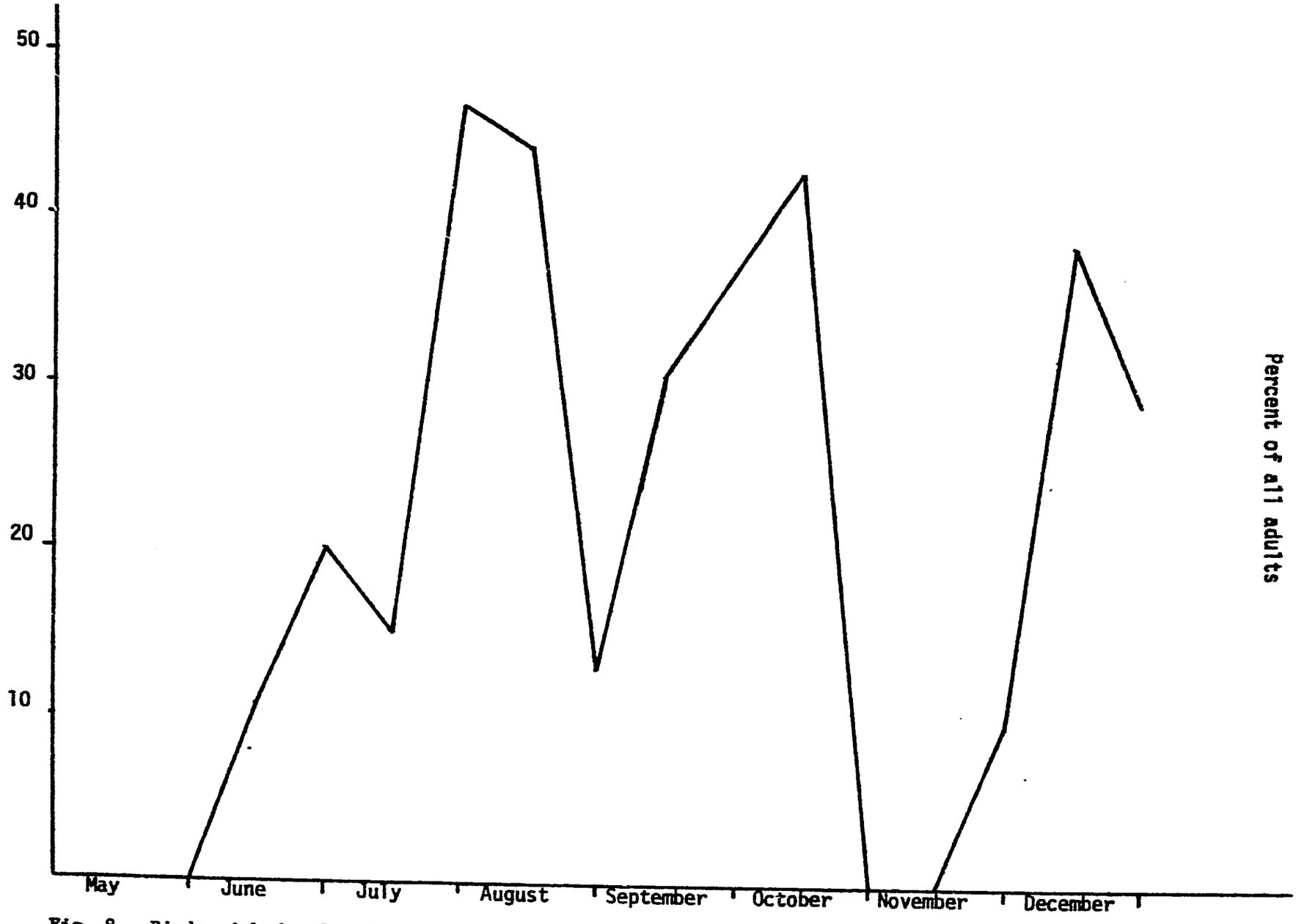


Fig. 8. Birds with developed crop glands by half month periods.

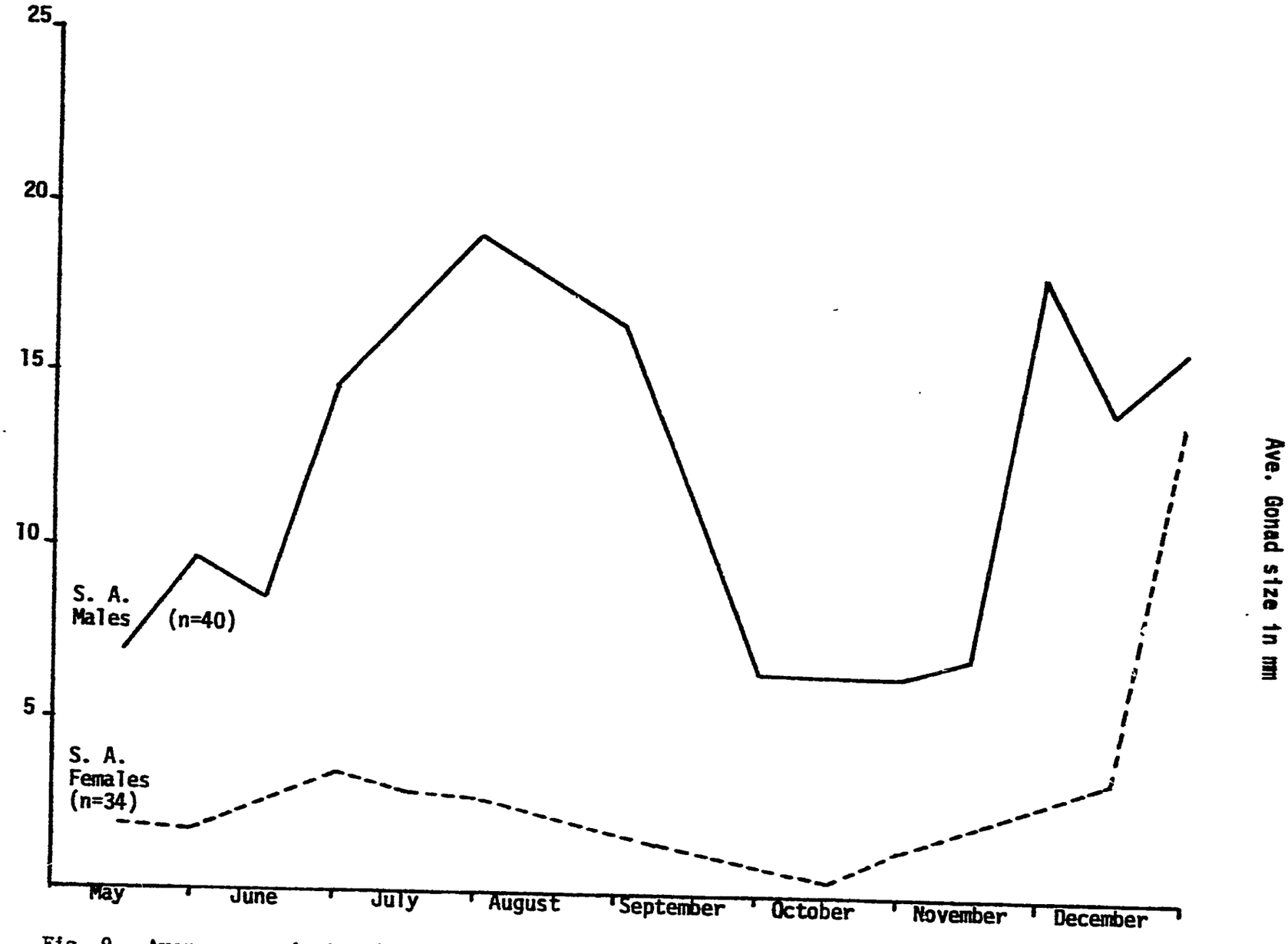


Fig. 9. Average gonad size (length of longest testis & diameter of largest ovary) of 74 subadult eared doves by half month periods.

During this year, only a few dove nests were located and most of these incidental to collecting birds (Table 7).

Diseases and parasites.--Doves were placed in individual plastic bags to collect ectoparasites. Blood smears were made and the birds were checked for growths, lesions, and parasites (Fig. 5).

Doves and blood smears were taken to the University of Valle and examined for blood parasites and sarcocystis[2]. Tapeworms were sent to DWRC for identification.

The diseases and parasites found in these eared doves appear in Table 8. With the exception of trichomoniasis, the diseases or parasites encountered do not appear to cause any physical harm to the doves.

Doves having trichomoniasis were underweight (average weight = 94 g), and two died of apparent starvation shortly after being captured. The disease is thought to cause nestling mortality in white-winged doves (Cottom and Trefethen, 1968), but we do not know what effect this disease has on the eared dove population.

## Dove Damage Appraisal Studies

### Procedures

Evaluation of bird damage to crops is necessary to determine the birds' economic effect, to evaluate results of control experiments, and to determine cost-value relationships of control programs.

Some damage caused by eared doves to soybeans may occur at plant emergence assuming the birds will feed upon the cotyledons. The effect of this type of damage on crop production is unknown. To determine the effect, soybeans (ICA-Lili) were planted in four-row plots and two linear meters randomly selected for manual damage. Six and seven days later, all the emergent plants were damaged (removal with scissors of one or two cotyledons). Subsequent emerging plants were untouched. There were nine replications. The number of plants in these plots were counted on the 11th and 12th days after planting.

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[2] By Dr. Maurice Thomas and Dr. Stephen Ayala.

Table 7. Eared dove nests observed during 1973 in the Cauca Valley.

| Date | Location | Contents | Comments |
|---|---|---|---|
| June 13 | On ground in pasture, ICA | 2 eggs | Abandonded - June 18 |
| June 13 | On ground in pasture, ICA | 2 eggs | Destroyed - cows - June 25 |
| June 26 | On ground in pasture, ICA | 2 eggs | Abandonded - 2 nestlings - July 2 |
| July 30 | On ground in pasture, ICA | 1 eggs - 1 nestling (4 - 6 da. old) | Not rechecked |
| December 3 | In thorn tree-Fence line CIAT | 2 nestlings (6 - 8 da. old) | Empty - December 11 |
| December 6 | In brush Rio Amaime Canyon | 2 eggs | Not rechecked |
| December 6 | In cactus Rio Amaime Canyon | 2 eggs | Not rechecked |
| December 7 | In thorn tree-Fence line, CIAT | 2 eggs | Destroyed - predator - December 11 |

Table 8. Diseases and parasites of the eared dove encountered in 1973.

| NAME | NO. OF DOVES EXAMINED | NO. INFECTED |
|---|---|---|
| Haemoproteus | 187 | 174 |
| Trichomoniasis | 465 | 6 |
| Sarcocystis | 6 | 5 |
| Fowl Pox | 465 | 1 |
| Intestinal Cestodes | 219 | 20 |
| Subcutaneous Nematodes | 465 | 1 |
| Hippoboscid Flies | 407 | 304 |
| Lice | 407 | 4 |
| Mites | --- | 1* |

* Incidental find (Birds were not examined for mites).

### Results and Discussion

There seems to be no apparent effect on plant density from this type of simulated damage (Table 9).

Damage was simulated when cotyledons were opening and when the primordial leaf buds were developing. This may or may not be the reason that plant density was not affected. In future studies damage will be simulated earlier while the cotyledons are united and the primoridal leaf bud slightly developed. Damaged plants will be marked and followed through development and production.

## Dove Damage Control Studies

### Procedures

In collaboration with SENA (National Learning Service), ICA-Lili soybean seeds were treated with DRC-736 (Methiocarb) and planted in Buga on March 16 to test the effectiveness of this chemical repellent in reducing dove damage to emergent soybeans. Seeds were treated in a water slurry and 16 hectares of soybeans were planted.

Two lots of 4 hectares were planted with seeds treated with DRC-736 at 0.25% and 0.10%, respectively; two lots of 4 hectares were planted with untreated seeds and were used as reference plots; and another lot (1 hectare) was planted with seeds treated with only water and latex. All seeds had been treated with Arasan. No bird scarers were used in any of the lots.

### Results and Discussion

Small flocks of doves (10 to 50) were seen in the area before planting and for 3 days after planting. One dead dove was found the fifth day after planting and it contained 22 soybean seeds and 2 cotyledons. The drought affected the germination of all lots and emergence was delayed in various portions of each lot. Initially, the stand of soybeans in the 0.25% treatment was twice as good as the 0.10% and both appeared better than the reference lots. The lot with the water-latex treatment had the poorest stand of soybean plants.

Dove depredation began the day of planting (birds feeding on seeds left on the surface). From that day until germination the number of doves in the immediate area decreased from flocks of 10 to 50 to pairs and singles. It seemed that doves feeding on the treated seeds were first repelled from the treated plots and finally from the area of the lots and protected the emerging plants.

Table 9. Number of plants (per meter) 5 days after dove damage was simulated.

| Day of damage | Type of damage No. of cotyledons removed | Average No. of plants per meter | Range |
|---|---|---|---|
| 6th. day after planting | 0 | 21.00 | 18.0-25.5 |
| | 1 | 24.28 | 15.5-34.5 |
| | 2 | 19.45 | 13.5-27.0 |
| 7th. day after planting | 0 | 19.61 | 11.5-25.5 |
| | 1 | 21.78 | 13.5-29.0 |
| | 2 | 20.72 | 13.5-27.5 |
| 6th and 7th day after planting | 0 | 20.31 | 11.5-25.5 |
| | 1 | 23.03 | 13.5-34.5 |
| | 2 | 20.09 | 13.5-27.5 |

Due to poor germination and drought, plans were made to replant the lots but a lack of birds, time, and weather made it impractical.

Twenty-eight days after planting, a 1.0% random sample of the plots was taken (Table 10).

This data plus the field observations indicate good repellent effect but more tests and better qualitative and quantitative evaluations are needed.

Treating soybean seeds with Methiocarb does not seem to affec' _ermination or production (Table 11).

Observations indicate that surface baiting instead of seed treatment may be the better method of controlling dove damage in emerging soybeans.

Very little progress has been made on developing a good and simple damage appraisal technique for emergent soybeans.

## Shiny Cowbird Damage in Colombia

### Introduction

The shiny cowbird (*Molothrus bonariensis*) is a pest in corn, rice, and sorghum in many Latin American countries. It periodically causes serious damage to experimental and commercial plantings in Colombia. This bird may become a serious problem in Colombian agriculture.

### Procedures

In order to further test the effectiveness of DRC-1327 as a damage control agent for shiny cowbirds, 1 acre of sweet corn was planted at the ICA Research Station in Palmira. Unfortunately, bad seeds were planted and the germination was very poor. Plans to replant were unsuccessful because of weather and time.

Shiny cowbirds were collected, the contents of their esophagi and gizzards were saved for identification, and their reproductive organs examined.

### Results and Discussion

During 1973, 50 cowbirds were collected and examined (Tables 12 and 13). Of these, 23 were examined for ectoparasites and 34 for endoparasites.

Table 10. Number of plants per meter in a 1.0% sample of treated soybean fields.

| Treatment | Plants/meter |
|---|---|
| A 0.25% DRC-736 | 6.4 |
| B 0.10% DRC-736 | 2.5 |
| C Control I (between A & B) | 2.5 |
| D Control II (next to B) | 4.1 |
| E Control III* (next to D) | 4.7 |
| Control (mean of C, D & E) | 3.5 |

* $H_2O$ & Latex

Table 11. Information obtained from plants randomly collected in the soybeans test fields at harvest with speculated yields.

| Treatment DRC-736 | No. of Pods per plant | No. of Beans per plant | No. of Plants per meter | No. of Kilos ** per hectare |
|---|---|---|---|---|
| A (0.25%) | 36.09 | 51.1 | 6.40 | 1090.16 |
| B (0.10%) | 42.06 | 58.8 | 2.49 | 488.05 |
| C (0.0%) | 33.42 | 41.0 | 2.52 | 344.41 |
| D (0.0%) | 33.42 | 41.0 | 4.11 | 561.71 |
| E (0.0%*) | 33.42 | 41.0 | 4.77 | 651.91 |
| Control (mean) | 33.42 | 41.0 | 3.48 | 475.61 |

* Latex & Water

** 16.667 linear meters per hectare
5000 beans per Kilo

Table 12. Age and Sex Composition by month of shiny-cowbird collected in 1973.

| Month | No. Collected | Male | Female | Young | Adult | % Young | % Adults |
|---|---|---|---|---|---|---|---|
| May | 19 | 11 | 8 | 8 | 11 | 42 | 58 |
| June | 4 | 3 | 1 | | 4 | | 100 |
| July | 6 | 2 | 4 | 2 | 4 | 33 | 67 |
| August | | | | | | | |
| September | 12 | 11 | 1 | 10 | 2 | 83 | 17 |
| October | | | | | | | |
| November | 3 | 2 | 1 | | 3 | | 100 |
| December | 6 | | 6 | 3 | 3 | 50 | 50 |
| Total | 50 | 29 | 21 | 23 | 27 | 46 | 54 |

Table 13. Measurements of reproductive organs of adult shiny cowbirds collected in the Cauca Valley, 1973.

| Month | Number Collected | | Testes Measurements* | | Ovary Measurements** | |
|---|---|---|---|---|---|---|
| | Male | Female | Mean (mm) | Range | Mean (mm) | Range |
| Jan.-April | | | | | | |
| May | 6 | 5 | 8.7 | 8.0-10.0 | 11.9 | 4.6-19.0 |
| June | 3 | 1 | 9.9 | 9.4-10.8 | 11.0 | |
| July | | 3 | | | 10.9 | 9.9-11.6 |
| August | | | | | | |
| September | 1 | 1 | 11.5 | | 6.1 | |
| October | | | | | | |
| November | 2 | 1 | 11.8 | 11.1-12.6 | 10.3 | |
| December | | 3 | | | 10.2 | 5.9-14.3 |
| Total | 12 | 14 | 9.7 | 8.0-12.6 | 10.7 | 4.6-19.0 |

* Length of longest testis
** Diameter of largest ovary

Two birds had both endoparasites and ectoparasites and one had only evidence of endoparasites.

Near Palmira and Cali flight lines of shiny cowbirds were observed in October. However, no roosts were located this year. In October a flock of 100 to 200 birds were observed damaging commercial sorghum north of Tulua.

## Migratory Bird Damage in Colombia

### Introduction

The dickcissel (*Spiza americana*) and the bobolink (*Dolichonix oryzivorus*) are implicated in rice and sorghum damage in Mexico, Nicaragua, Costa Rica, Venezuela, and Colombia.

Efforts to locate concentrations and damage in Colombia have been fruitless.

### Procedures

We have relied on reports from agricultural agencies in the investigation of migratory bird damage. If reports seemed reliable, additional information was requested.

Reports of bird damage to rice were received from the Llanos (ICA/Villavicencio and ICA-CIAT/Carimagua). Some DRC-1327 treated rice and DRC-736 head spray were sent to the areas along with instructions. Further information as to species was requested.

A trip to the area could not be made because of transportation problems.

### Results and Discussion

Very few reports of suspected dickcissel and bobolink problems were received and many requests for additional information were not answered. Recent reports of damage to rice and sorghum in areas within the suspected range of these species (Meyer de Schauensee, 1964; 1966) have been the result of local nonmigratory birds (Table 2). Other migratory species have also been implicated in agricultural damage in Colombia, e.g., ducks, herons, rails, swallows, and tanagers (Table 2), but most are local and not economically important.

A followup report from CIAT personnel in Carimagua indicated poor results with ground baiting with DRC-1327.

Some specimens of the birds doing damage to the experimental rice plots in Carimagua were brought in for identification. They were:

1. Oriole Blackbird (Gymnomystax mexicanus)
   Serious but seasonal damage

2. Seedeaters (Sporophila, sp.)
   Several species, serious and year-round

3. Red-breasted Blackbird (Leistes militaris)
   Not serious and seasonal damage.

After the application of both DRC-1327 and DRC-736, some dead and affected birds were seen by field hands. However, a recent application of Furidan may have been responsible for these intoxicated birds.

No reports were received from ICA/Villavicencio.

Several reports were received concerning birds causing damage to apiculture near Bogota and Cali. Based on a report from Bogota (which appeared in a local paper entitled "Invasion de Cardenales") and additional information, the summer tanager (Piranga rubra) has been a serious pest to beekeepers in this area for at least 5 years. When other food is scarce, this bird consumes thousands of bees from the apiaries. Other reports involved nonmigratory species on a local basis (Table 2).

## Psittacidae Damage in Colombia

No reports of damage were received and no investigations conducted.

## Black Vulture Damage in Colombia

We were informed by the African Palm Plantation "La Arenosa" near Turbo that the black vulture damage to African Oil Palm fruit is continuing but Inderena has not offered any suggestions as to what methods of control would be permitted. Bird scaring personnel, as well as coverings, would solve the problem but may not be economical or convenient to the operation.

## Miscellaneous Studies

### Introduction

In a cooperative study with ICA's Section of Weed Control, we attempted to determine if the seeds and tubers of certain weed species, when eaten by birds, are destroyed or disseminated. In the case of caminadora (*Rottboellia exaltata*), whose seeds, because of their structure, have a low initial germination rate, we thought that certain bird species may act as an important factor in disseminating this serious weed pest.

### Procedures

In the first study three eared doves were each force-fed 40 caminadora seeds and placed in individual cages with food and water. A paper was placed under each cage to collect the droppings. After 24 hours, the droppings were examined and the birds were again force-fed 40 seeds. After 1 hour, the birds were sacrificed and the contents of the crops, gizzards, and intestines were examined.

In the second study, two doves were force-fed 40 caminadora seeds and two doves were force-fed six tubers of coquito (*Cyperus rotundus*) each day for 3 days and were sacrificed on the fourth day. The birds were placed in individual cages with food and water, and a paper under each cage to collect the droppings. The droppings were examined daily and the intestines, gizzards, and crops were examined on the fourth day.

### Results

In the first study, the droppings and the intestines did not contain any distinguishable seeds. Each gizzard contained up to five caminadora seeds plus grit and other food material and each crop contained around 35 caminadora seeds and other food material.

In the second study, there was some regurgitation of the large coquito tubers, but the tubers and caminadora seeds were completely digested by the doves. The droppings and the contents of the intestines did not contain any distinguishable seeds or tuber material, and the gizzard and crops contained only other food material.

Both studies indicate that the eared dove which consumes tubers of *Cyperus* sp. and the seeds of *R. exaltata* completely destroy and do not disseminate this material.

## RESEARCH ACTIVITIES - NICARAGUA

### Rodent Damage to Rice in Nicaragua

#### Introduction

Research activities on the problem of rodent damage to rice in Nicaragua were initiated in 1971 and continued in 1972 (see annual reports for these years). Excellent cooperation was received from cooperators there. Plans for increasing and expanding the work were formulated and required equipment for laboratory studies was ordered and shipped to Managua. A devastating earthquake struck and destroyed much of Managua during the last week of December 1972. Among the buildings destroyed was the Banco Nacional de Nicaragua. Records, data, and other information related to this project were lost. The proposed plans were necessarily postponed and research into this problem was at a minimum this year. Personnel of the Banco Nacional did continue with monthly trapping studies to follow the population fluctuations of the cotton rats (*Sigmodon hispidus*) in the rice fields. Results for the first 6 months of 1973 are presented here. Results of the last 6 months have not been received at the time of writing.

#### Procedures

A series of traplines (traps set at 10-m intervals) were set for 1 night in different habitat types. Victor 4-way traps with raw potato as bait were used. The sex of animals captured was recorded to obtain an estimate of sex ratio, but no attempt was made to estimate age class. Results are summarized in Table 14.

#### Results and Discussion

A total of 980 trap nights during the 6-month period yielded 145 animals for an overall trap success of 14.8% (Table 14). In comparison overall trap success in 1972 was 7% and in 1971 was 51% (see 1971 and 1972 annual reports). This year we found an approximate sex ratio of 1.1 males per female as compared to 1.44 males per female in 1972 and 1.27 females per male in 1971. Sample sizes during the 3 years are not equal; therefore, statistical comparisons are not made. In general, it appears that a very high population was present in 1971 and a much lower population was present in 1972. A slight increase is noted in 1973, perhaps indicating a cyclic population. A continuation of this population sampling would help to identify the length of the cycle, if it exists, and would assist in predicting when high populations and resultant damage to rice crops might be expected. This type of information would be extremely useful in damage control planning. It is recommended that the population trend study be continued.

Table 14. Results of trapping survey January-June 1973 on Finca "El Triunfo", Tipitapa, Nicaragua.

| Line | Date | Trapnights | | Total Animals | Male | Female | % Su |
|---|---|---|---|---|---|---|---|
| 1 | Jan. 23-24 | 45 | Stubble rice field | 0 | 0 | 0 | |
| 2 | | 45 | Drained young rice field | 0 | 0 | 0 | |
| 3 | | 45 | Flooded mature rice | 3 | 2 | 1 | |
| 4 | | 45 | Drained mature rice | 6 | 4 | 2 | |
| 1 | Feb. 28-29 | 45 | Flooded mature rice | 7 | 3 | 4 | |
| 2 | | 45 | Flooded mature rice | 18 | 12 | 6 | |
| 3 | | 45 | Plowed field | 3 | 2 | 1 | |
| 4 | | 45 | Drained mature rice | 18 | 8 | 10 | |
| 1 | Mar. 25-26 | 45 | Drained mature rice | 22 | 7 | 15 | |
| 2 | | 45 | Drained mature rice | 23 | 11 | 12 | |
| 3 | | 45 | Drained young rice | 3 | 3 | 0 | |
| 4 | | 45 | Plowed field | 0 | 0 | 0 | |
| 1 | Apr. 26-27 | 50 | Flooded mature rice | 8 | 6 | 2 | |
| 2 | | 45 | Flooded mature rice | 10 | 5 | 5 | |
| 3 | | 55 | Drained mature rice | 17 | 9 | 8 | |
| 1 | May 30-31 | 65 | Stubble rice field (ripening) | 7 | 4 | 3 | |
| 2 | | 45 | Stubble rice field " | 0 | 0 | 0 | |
| 3 | | 45 | Stubble rice field " | 0 | 0 | 0 | |
| 1 | Jun. 21-22 | 45 | Plowed field | 0 | 0 | 0 | |
| 2 | | 45 | Plowed field | 0 | 0 | 0 | |
| 3 | | 45 | Plowed field | 0 | 0 | 0 | |
| | | 980 | | 145 | 76 | 69 | |

## Dickcissels and Rice in Nicaragua

### Introduction

In late 1972, a preliminary survey was conducted by personnel from this station along with cooperators from the Banco Nacional de Nicaragua relative to rice damage by dickcissels (*Spiza americana*). Results were reported in the 1972 Annual Report.

During 1973, field studies were carried out by John W. De Grazio (DWRC) and Banco Nacional personnel. Personnel of this station did not participate. Results of these studies were reported by De Grazio in his trip report, "Nicaragua - September 26-October 10, 1973," and will appear in the DWRC-AID Programs Annual Report for 1973.

Detailed plans for future field trials in Nicaragua during 1974 were discussed during Mr. De Grazio's visit to this station in August 1973.

## PUBLICATIONS

Elias, Donald J. and Danilo Valencia G. 1973. Control de roedores en el cocotero. In ICA Informa No. 8 Agosto, 1973. Instituto Colombiano Agropecuario. Botota, Colombia.

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Woronecki, Paul P. 1973. Rodent problems in the Darien of Colombia. Biological Conservation, Vol 5, No. 3, July 1973. Applied Science Publishers, Ltd., England.

Woronecki, Paul P., Jose Fernando Londono V., Donald J. Elias, Danilo Valencia G., Everardo Vogel, Rene Bojorge, and Julio Sequeira F. Vertebrate damage control research in agriculture. 1972 Annual Report. Palmira, Colombia. (Both English and Spanish versions published in mimeograph form and distributed to interested persons and institutions.)

In addition, ICA Bogota released information and/or reports along with permission to publish which resulted in the following:

Elias, Donald J. y Danilo Valencia G. 1973. Evaluacion y control de dano de roedores en coco en Colombia. I Parte. In Agricultura de las Americas; una publicacion tecnica de Colombia para las Americas. 15 de Julio - 15 de Agosto. Bogota, D.E.

Elias, Donald J. y Danilo Valencia G. 1973. Evaluacion y control de dano de roedores en coco en Colombia. II Parte. In Agricultura de las Americas; una publicacion tecnica de Colombia para las Americas. 15 de Agosto - 15 de Septiembre. Bogota, D.E.

Elias, Donald J. y Danilo Valencia G. 1973. Evaluacion y control de dano de roedores en coco en Colombia. III Parte. In Agricultura de las Americas, una publicacion tecnica de Colombia para las Americas. 15 de Septiembre - 15 de Octubre. Bogota, D.E.

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## CONFERENCES AND PRESENTATIONS

On 26 April, Jose F. Londono presented a talk on the eared dove problem in Colombia at an Animal Ecology Seminar at the University of California at Davis.

On June 7, in Villa de Leiva, Colombia, James M. Ramakka gave a presentation about eared dove research to approximately 30 participants at the First Annual Peace Corps Conservation Program Conference.

On July 12, Paul P. Woronecki participated in a discussion of environmental ecology at the Centro Colombo Americano in Cali. Participants were Dr. Jose A. Villegas of UNESCO, several professors from the Universidad del Valle, and representatives of USIS.

On 1 August, Paul P. Woronecki helped conduct the Vampire Bat Control Seminar in Valledupar, Cesar, Colombia. He presented the section on systemically treating cattle with diphenadione.

On 18 September, at ICA-Nataima (Espinal) Danilo Valencia G. gave a talk, "Control of Vertebrates in Rice," to a group of agronomists from FEDEARROZ.

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ERRATA SHEET FOR

VERTEBRATE DAMAGE CONTROL RESEARCH IN AGRICULTURE,
Investigaciones Sobre el Control de Danos Causados
Por los Vertebrados En La Agricultura.

We regret a substantive error in this report. Please note as follows:

1971 Annual Report; Palmira, Colombia - page 20, Table 4

There should be a decimal point before the last digit on all measurements, e.g.,

| | | |
|---|---|---|
| 190 mm | should be | 19.0 mm |
| 160-210 mm | should be | 16.0-21.0 |
| 56 mm | should be | 5.6 mm |
| 20-90 mm | should be | 2.0-9.0, etc. |

1972 Annual Report; Palmira, Colombia - page 13, Table 3

Table should state: Measurements in cm.