THE CHANGING RODENT PEST FAUNA IN EGYPT

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ABSTRACT: The most serious known rodent pests in agricultural irrigated land are: Rattus rattus, Arvicanthis niloticus and Acomys sp. Occasionally there are rodent outbreaks in agricultural plantations. The changing agro-ecosystem in the present and future agricultural plantations is expected to affect the status of the following potential rodent pest species: Spalax ehrenbergi aegyptiacus, Nesokia indica, Jaculus orientalis, and Gerbillus gerbillus gerbillus. Basic studies are needed to quantify damage including water loss, which is caused by rodents, forecast of rodent outbreaks, and integrated control of rodents in agricultural projects.

INTRODUCTION

The depredations of rodents and the struggle to prevent them will never diminish, even though man desires to raise his standard of living and health. In the face of the rapidly rising human population in Egypt, the problem has become more acute.

The pattern of rodent populations is changed when man converts deserts, forests and rangeland into food or fiber production schemes. This is a common feature of the Middle East region, including Egypt. In some cases such activities are carried out without prior knowledge of the actual fauna of the area, and the natural predators of rodents are driven away, or killed for food, or for the sake of their skins. As a result rodents increase in number and different rodent species may appear. The causes of shifts in species distribution are mostly due to changes in environmental conditions and the superior survival strategy of the replacing species.

There are several examples of a predominant rodent species being replaced by another one under various ecological conditions. There is the replacement of Rattus rattus by Bandicota bengalensis in Calcutta (Seal and Banerjee, 1966), Rattus rattus and Mus musculus by Tatera i. indica in Rajasthan (Jain, 1970), and the replacement of Meriones hurrianae and T. i. indica by Gerbillus gleadoni after a control campaign in Rajasthan desert (Prakash, 1975).

The present note discusses the changing agro-ecosystem in Egypt and its possible impact on the status of rodent pest problems concerning the prevailing species and their densities.

IMPORTANT RODENT PEST SPECIES IN EGYPT

The most important known rodents as agricultural pests and vectors in Egypt are grouped as follows (Hoogstral, 1963):

Commensal Rodents

These include rodents of the Ethiopian fauna (Arvicanthis niloticus and Acomys) and other rodents (Rattus norvegicus, Rattus rattus, and Mus Musculus) which are the Near East Africa components.

Desert Rodents

The available information about these rodents is not complete in spite of the fact that the Middle East contains the greatest part of the world's largest arid zones stretching from Sahara to Sind and including Egypt. Desert rodents known as potential pests in Egypt are:

1. Cricetidae: Gerbillus g. gerbillus (Egyptian lesser gerbil). It is the most common mammal in desert and semidesert areas on both sides of the Nile, Fayoum, and Bahareyya Oasis.

   Gerbillus p. pyramidum (greater gerbil). It is a strictly desert margin inhabitant, burrows in palm groves, sandy cultivated patches and newly reclaimed desert areas. It is associated with dense concentrations of people and domestic animals and does not inhabit older silted farmlands or extreme deserts. Burrows are usually slightly moist.

   Meriones crassus (Shaw's Jird). It is associated with desert shrubs usually in comparatively well vegetated desert valleys.

   Psammomys obesus (fat sand rat). It is often found around the base of the plants Anabasis articulata and Hyloxion schweinfurski and near brackish water in saline areas.

2. Spalacidae: Spalax ehrenbergi aegyptiacum (mole rat). It is found in the Mediterranean littoral semidesert area from Alexandria and westward, and subsists on lily bulbs (Muscari sp.) on hills. Its mounds are never found in low areas that are liable to be flooded. These mounds contain nesting and storage chambers and are connected with somewhat damp tunnels. It is completely adapted for underground life but could be caught with onion bait hung in an opened burrow. It is considered as a nuisance since its long tunnels probably damage plant roots, yet it plays an important role in developing the soil.

3. Muridae: Nesokia indica indica (bandicoot rat). It is found in low saline depressions near Suez, Beheira, and Bahariya Oasis. It digs shallow moist tunnels near gardens, cultivated plots, desert slopes near saline lakes, palm groves, and sides of ditches or dikes. The main food is Typha latifolia and Alhagi maurorum, the fleshy parts of which are stored in chambers off the burrows. It causes damage to corn, barley and vegetables. Recently it has become a serious pest to agriculture in the Suez Canal Zone. It also undermines water channels through weakening their banks and is the cause of much land erosion.

   Nesokia i. suilla. It is found in Bahariya Oasis, which is the most western locality in the distribution of the genus.

4. Dipodide: Jaculus jaculus jaculus (lesser Egyptian jerboa). It is found in desert areas on both sides of the Nile, along Cairo-Suez Road, and Kharga Oasis whenever there is a little vegetation, but it never invades cultivated areas.

   Jaculus orientalis (greater jerboa). It is common on desert slopes near the Mediterranean Sea and attacks barley.

   Allactaga tetradactyla is common in western desert and low moist valleys and is expected to disappear when the coastal valley is intensively cultivated.

THE CHANGING AGRO-ECOSYSTEM AND RODENTS IN CULTIVATED AREAS

The Construction of the High Dam

a. As a result of excess water obtained after the construction of the High Dam, basin irrigation was replaced by perennial irrigation in Upper Egypt and it was easy to grow crops all year-round. Accordingly, there was a spread of human settlements and an increase of agricultural land with well watered canal banks, which were eventually covered by a dense growth of monocotyledon ditch-bank weeds. There were also changes in cropping pattern with an increase in the acreage of rice and sugarcane plantations. These changes are now responsible for the increase of commensal rodents, particularly the grass rat, Arvicanthis niloticus, which is now changing its habits and sometimes enters human settlements (Arafa, 1968). There is now also an increase in the population of the white-belly rat, Rattus rattus frugivorus, a notorious pest attacking paddy rice, sugarcane plantations, and poultry farms.

b. The annual flooding of the Nile was capable of flooding rodent burrows along the Nile and the irrigation areas in the basin, which was convenient for rat control in Egypt. Now, with the absence of annual flooding, rodents are able to make their burrows at a level which is never submerged by water. This has encouraged multiplication and development of rodents in Egypt, which has also been noticed by Schuyler (1970).

The Application of Pesticides

The use of pesticides to control major cotton pests, especially during the fifties when chlorinated hydrocarbons were being applied, had a bad effect on predators of rodents such as birds of prey. Accordingly, without the predators, a number of rodents tended to increase.

THE CHANGING AGRO-ECOSYSTEM AND RODENTS IN DESERTS

Arid and semiarid ecosystems are changing as new land is reclaimed for agriculture depending on artisian and/or Nile water. Apparently animals living in these areas have adapted to severe conditions of the environment including scarcity of food and water, and the change in agrosystem is expected to affect the distribution and replacement of rodent species. For instance, it is known that Jaculus never invade established cultivated areas and consequently they are expected to disappear whenever a desert area is intensively cultivated. The following is a comparison of the status of the changing rodent fauna at three areas that are at different stages of reclamation:

An Area at the First Stages of Reclamation

To find out the annual change in species distribution in a newly reclaimed area, a farm was chosen that belongs to the Faculty of Agriculture, Assiut University. It is located in a semiarid area and is gradually being reclaimed. Seventy snap traps were set up daily in a fixed area starting March 1, 1976. Table 1 shows the total catch of rodents and percentage of each species trapped within the area. The data represent two years, the first ending in February 1977 and the second one ending in February 1978.

These figures tend to show some changes in density of species. This is due to the gradual changes in the agrosystem where reclamation of this area is occurring. Data obtained in the coming years will give a better clue about these changes.

An Area at a Later Stage of Changing Ecosystem

The effect of a more advanced change in a semiarid zone ecosystem was studied by Salit (1972). The percentage of prevailing rodents was recorded during 1965 in a grazing area at the border of the eastern boundaries of the Nile Delta, and during 1969 at the same area when it was then occupied by human camping facilities (Table 2).

Table 1. Percent distribution, number trapped, and trap index of rodent species trapped in an Assiut Farm during 1977 and 1978.

	1977	1978
Rattus r. frugivorus	15.2	17.7
Rattus r. alexandrinus	44.0	27.6
Arvicanthis niloticus	1.79	7.0
Gerbillus	37.9	41.7
Jaculus	1.1	6.1
Meriones	0.004	0.0
No. animals trapped	559	598
Trap index	0.0221	0.0237

Table 2. Percent distribution of rodent species in Eastern Delta during 1965 and 1969.

	1965	1969
Rattus r. frugivorous	0.0	68.15
Jaculus	2.3	0.0
Meriones	17.3	0.0
Gerbillus	80.4	31.85

These figures show that the wild rodents found during 1965 were partially replaced by Rattus r. frugivorus after the establishment of human installations.

A Well Reclaimed Area

Once the agrosystems have been modified, significant changes are expected in the well developed reclaimed areas. In one area in Tahrir Province developed 20 years ago, there was a replacement of rodent species. Rattus norvegicus and Mus musculus are now established in the north, adjacent to the coastal area, and Rattus r. frugivorus is now dominant in the southern sector, being attached to the main agricultural area of the Delta (Mahdi et al., 1972).

DISCUSSION

Rodent depredation on stored food and agricultural products is considered both an agricultural and public health problem because of the transmission of rodent-borne diseases as well as the destruction of human food.

In Cultivated Areas

In a recent survey (Shooba, 1976), it was found that Rattus r. frugivorus, R. r. alexandrinus and Acomys cahirinus form 27.08, 25.77 and 23.58% of the total rodent population in Gizah, indicating that R. r. frugivorus now comes first and that the three rodents constitute 76% of the rodent population of the area. In stores and foodstuff factories in Cairo, Omar (1977) found that the rat indices are 0.101, 0.044, 0.037, 0.027, and 0.007 for Acomys dimidiatus, A. cahirinus, Mus musculus, Rattus r. frugivorus, and R. r. alexandrinus, respectively. Apparently R. r. frugivorus is now becoming the dominant rodent pest in cultivated areas and is still important in stores. It is serious in areas contaminated with monocotyledon ditch-bank weeds along water canals, in orchards, and also in sugarcane plantations.

In Desert Areas

There is always a need to study the changing rodent fauna in desert areas because their parasites are causative agents of diseases. Normally, most of these animals are tolerant to these diseases. Outbreaks of a disease comes when there is an abnormal increase in the rodent population, and many of these rodents are susceptible to such diseases. Outbreaks of a disease may also be favored by newcomers, who are usually more susceptible to the disease. This can happen due to man's interference through projects in land reclamation. He will be, under certain circumstances, in direct contact with wild rodents which are tolerant, while he is susceptible to the disease. Again, the commensal rodents may accompany man and eventually invade the newly reclaimed area. Commensal rodents, at this state, are quite susceptible to disease which are easily transferred through the parasites of the desert fauna. Consequently, the major problems concerning rodents at the early stages of reclamation projects are mostly due to their transmission of diseases. With further reclamation development, the commensal rodents increase while the wild ones retreat, and the losses in agricultural material and food production would increase accordingly. For example, Rattus r. frugivorus has successfully invaded the desert reclaimed area. The more this animal is distributed in this area, the more damage it will cause to food, agriculture, and other installations. It should be recommended that it is better to take steps to delay the invasion of commensal rodents for as long as possible and at early stages of reclamation so as to prevent the transference of parasites between wild and commensal rodents. This can be accomplished to some extent with environmental sanitation, especially within the dwellings of laborers which are the major structures built for reclamation personnel.

There is now considerable attention given to the southern parts of Egypt on the border with Sudan. In that respect the study of faunal and floral changes is expected to be correlated with the geomedical zone. Hoogstral, et al. (1955), studied rodent populations at southeastern Egypt, which is considered by zoogeographers to be of the Ethiopian Region. They stated that this area includes rodents of Near East Africa. They also suggest that the vector-borne disease aspect of this area is largely one of North Africa and the Near East and that Gerbillus p. pyramidum and Acomys dimitiatus may be suspect as a reservoir because of their large population in rocky outcrops and on the coastal plains, respectively. Since there are many reclamation projects accompanied by more new human settlements on both sides of the border between Egypt and Sudan, one should realize the extreme importance and need for a thorough systematic study of the changing status of rodents particularly in this area.

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