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Observations on an exceptionally dense population of wild rats in marshland

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Surveys in sections of marshland adjacent to ricefields in Laguna de Bay revealed breeding populations of *Rattus rattus mindanensis* in excess of one adult per m². Build-up of dense rat populations in marshland may be related to the historical rat "outbreaks" reported in the Philippines.

While surveying crop damage by rodents in ricefields bordering the Laguna de Bay marshes south of Manila, we encountered an exceptionally dense population of wild rats (*Rattus rattus mindanensis*) in a section of marsh near Mabitac, Laguna. The rat densities far exceeded any of our previous observations and were even more remarkable in that extensive nesting was occurring.

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We first learned of the dense mashland population in early November 1973, when farmers from Lukong in Mabitac complained of heavy rat damage in their fields. The barrio's agricultural lands comprised about 450 ha and were farmed by about 300 individuals. On our first visit, we found that much of the growing rice had been completely destroyed by rats. Farmers told us that damage of this magnitude was not uncommon during the wet season when crops generally are planted from June to August and harvested from October to December. We were also told that rats were inhabiting the marshes, but we were unable to penetrate the area because of the thick vegetation and deep water. The numbers of rats occupying the damaged fields appeared relatively low, based on examination of dikes for active burrows.

Materials and methods

On two subsequent visits, we conducted a series of drives along the fringed areas of the wide marshland to obtain rough population estimates. Areas within 100 m of ricefields were arbitrarily chosen in the fringing vegetation, which consisted chiefly of *Scirpus grossus*, a tall sedge projecting 2 to 2.5 m above the waist-deep water.

In the first series of drives on 13 November, seven 20 m x 20 m sections of marsh area were laid out with the help of 20 men from barrio Lukong. In each section, a 1-m strip of vegetation was clear-cut around the perimeter to form a barrier. Two sections of 2.5-cm mesh nylon fishnet (approximately 1.3 m x 15 m), tied loosely to pointed bamboo support stakes set at 1.5 m intervals, were placed at one corner of an area. Then, rats were driven to it by cutting the remaining vegetation. Setting the fence, completing the drives, and transfer to a new location required about 1 hr for each section. In four of the seven drives, some animals were collected alive for transfer to the laboratory. Farmers assisting in the drives killed the remaining animals with sticks or knives. In each section, the number of adults captured, the number of escapes observed, the number of nests, and the number of young per nest were recorded.

A second series of drives was conducted in three sections of marshland, approximately 5 m x 5 m in the same general area, on 26 November. About 15 farmers participated; each operation required about 0.5 hr. In the 13-day period between the two dates, the area had been flooded for three days by an approximately 1-m rise in the level of Laguna de Bay. According to farmers, the water had fully receded about four days before our arrival.

Results and discussion

In the first series of seven drives, 2748 adult rats were captured (Table 1). Only 23 rats (less than one percent) were observed to escape by swimming under the net or by crossing the clear-cut barrier. The drives thus provided an extremely efficient means for collecting adult rats from this habitat. Similar results were obtained in collecting 104 rats during the second series of drives which encompassed smaller sections of vegetation.

In the earlier drives, 1098 nests were encountered as vegetation was cut. Of these, 587 contained young animals, the average litter size being 3.24. The sizes of litter in these nests were much smaller than those reported previously from embryo counts of the same species in rice land. Sanchez *et al.* (1) reported monthly mean litter size of 5.00 to 9.09, as did Marges (2), of 6.50 to 11.18. We suspect that the smaller litter sizes in our series of collections reflected increased infant and, perhaps, intra-uterine mortality related to the dense populations; however, no carcass examinations were made.

Nests were not counted during the second series of drives, but they were similarly abundant in the three sections of vegetation cleared. It appeared that the intervening flood had caused mortality of the litter populations throughout the area. We could not determine, however, whether adult rats left the area during the flood or simply moved higher up in the vegetation during the period of high water. Although systematic examinations of reproductive condition were not made, virtually all of the animals we handled appeared sexually mature.

Table 1. Adult rats, nests, and litter collected from seven 400-m² sections of marshland near Mabitac, Laguna.

Parameters	Sections							Total	Ave.
	1	2	3	4	5	6	7		
Adult rats captured	420	478	369	314	506	253	408	2748	392.6
Observed escapes	6	11	3	0	2	1	0	23	3.3
Number of nests	202	172	256	106	79	182	101	1098	156.9
Percent nests with litter	40.6	60.4	38.2	67.9	64.5	60.4	69.3	—	53.5
Juvenile rats recovered	316	320	417	208	122	311	208	1902	271.7
Mean size of litter	3.85	3.07	4.25	2.88	2.39	2.82	2.82	—	3.24

As indicated in Table 2, densities calculated from the capture data averaged more than 1 rat/m² or, by extrapolation, 10,000/ha. At the time of these observations, it was impossible for us to penetrate far enough into the marsh to determine extent of the area occupied by the dense rat population; however, reports from farmers suggest that dense populations occur commonly along the marsh edges and these may be forced into crop areas by rising water during the rainy season. By mid-March in the dry season water receded from the area where the drives had been conducted and only short, dry remnants of the marsh vegetation remained. During this time, we observed evidence of rats occupying the lakeward edges of the border mashes, nesting and feeding on water hyacinth (*Eichhornia crassipes*), pond lily (*Nelumbo nucifera*), and other plants. The wide central areas of the marshland and the seasonal importance of the border marshes as harborage for dense rat populations require further investigation.

Many of the historical rat "outbreaks" in the Philippines as described, for example, by Crucillo *et al.* (3) and by Villadolid (4) have occurred in areas adjacent to wide marsh-

Table 2. Estimated adult rat densities in marshland near Mabitac, Laguna.

Section	Date (1973)	Size of area (m^2)	No. of adult rat collected or observed	Estimated density (rats /m^2)
1	11.13	400	426	1.07
2	11.13	400	489	1.22
3	11.13	400	372	0.93
4	11.13	400	314	0.78
5	11.13	400	508	1.27
6	11.13	400	254	0.64
7	11.13	400	408	1.02
8	11.26	25	28	1.12
9	11.26	25	55	2.20
10	11.26	25	21	0.84
			Mean density $\pm$ SE:	1.11 $\pm$ 0.14

lands. We have repeatedly encountered reports of sporadically heavy rat infestations in areas bordering the Ligusan and Libungen marshes in Mindanao, in agricultural areas bordering the Candaba swamp and Chico river in Luzon, and in the area bordering Lake Naujan in Mindoro. While the less spectacular chronic crop losses due to the constant presence of rats in agricultural lands probably constitute a more serious economic problem on a national scale, study of the border marshlands may lead to better means of crop protection in areas where rats limit agricultural production, and to techniques for predicting and curtailing future "outbreaks".

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Literature cited

(1) F.F. Sanchez et al. (1971). Rodent Res. Ctr. Ann. Rept. 1971. 80 p.
(2) B.E. Marges (1972). M.S. thesis, Univ. of the Philippines at Los Baños. 43 p.
(3) C.V. Crucillo, F.Q. Otanes, and J.L. Morales (1954). Pest Control 22 (10): 9; 22(11): 10.
(4) D.V. Villadolid (1956). Araneta J. Agr. 3(2): 1.