

## RECENT DATA ON THE BROWN RAT *RATTUS NORVEGICUS* IN NIGERIA: RANGE EXPANSION, AND SOME ECOLOGICAL TRAITS IN THE NIGER DELTA REGION (MAMMALIA, RODENTIA: MURIDAE)

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**ABSTRACT** Recent data on distribution and ecology of brown rats *Rattus norvegicus* in southern Nigeria are presented in this paper. 446 specimens were captured during the various trapping sessions, all coming from urban habitats. More precisely, we found 193 (43.3%) specimens in rubbish dumps, 181 (40.6%) in food markets, 41 (9.2%) in dirty waters with muddy banks, 31 (6.9%) in ports. On the other hand, no specimens were captured in natural or semi-natural habitats of altered forests. Although our data demonstrate that brown rats are more widespread than previously supposed, until now this species was not observed in cultivated lands, rainforests and muddy banks of large rivers outside urban settlements.

**KEY WORDS** Brown rat, *Rattus norvegicus*, ecology, Nigeria

### INTRODUCTION

The only data available on the brown rat *Rattus norvegicus* (Berkenhout, 1769) in Nigeria are reported in Happold (1987). Happold's data came from two previous records reported by Connal (1926) and by Buxton (1936) and relative to Lagos. Rosevear (1969), in his monograph of West African rodents, did not cite any data from Nigeria, as well as from West Africa in general, if we do not take into account the few records available from Douala, Cameroon. It is also remarkable that brown rats appear rare and localized also in the adjacent Benin Republic, where the only data came from the coastal regions, i.e. Porto Novo (cf. De Visser et al., 2001).

Brown rats are not indigenous to Africa, and, according to Happold (1987), they arrived in Lagos by ships from other countries. Up to now, it seemed that brown rats were not able to establish themselves permanently in the coastal regions, nor have they been able to extend their range to other localities in the rainforest zone (Happold, 1987). Indeed, in Lagos (1931-1934) brown rats were only 5 % of the total trapped rats (*R. rattus* Linnaeus, 1758 and *R. norvegicus*).

Our data in this paper are new records on general species' distribution, and we also include preliminary morphometric data and on general traits on its ecology.

### MATERIAL AND METHODS

All specimens were captured by standard snap-traps for rats. For all cases, we used as bait a mixture of sweetened cereal flakes (Muesli), chocolate cream with hazelnuts (Nutella®) and/or smelling sheep's milk cheese.

At each site, twelve traps were randomly placed 5 m apart each from another. More in detail, we placed the

traps at some distance (approximately 3-6 m) from garbage dumps, as well as inside human settlements, in food-markets and cellars, always following the rat trails. On the other hand, traps were placed along muddy banks in ports and canals, as well as in altered forests, bushlands and cultivations.

Every trapping session, in each habitat type, lasted 21 days. Two trapping sessions per habitat were done, one during the dry season (from December 2001 to February 2002) and one during the wet season (from July to September 2002), for a total of 210 trapping days. Traps were put before twilight, and checked for rats the following morning between hrs 0700 and 0800 (Lagos time).

Five habitat categories were considered: (i) rubbish dumps, (ii) food markets, (iii) dirty waters with muddy banks, (iv) ports, and (v) semi-natural habitats in altered forests.

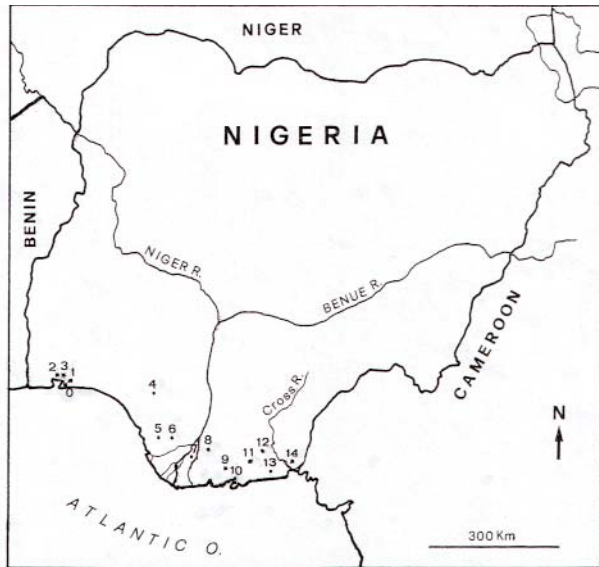
Apart from standardized trapping sessions, we also made some occasional opportunistic trapping sessions in additional localities, by using a variable number of traps, and just in order to identify new potential areas of presence of this species in Nigeria (Tab. 1).

Species identification was done following keys by Rosevear (1969), and Happold (1987).

### RESULTS

We trapped brown rats in several localities from Southern Nigeria (see tab. 1 and fig. 1 for place-names, states, and habitats).

During the sessions of systematic trapping in the Port Harcourt area, we captured in total 446 specimens of *R. norvegicus*, all coming from urban habitats. The distribution of the captures of brown rats in relation to habitat type and sympatric black rats *R. rattus* (total N = 387) is given in fig. 2. There were



**Fig. 1** Map of Nigeria with localities of occurrence of *Rattus norvegicus*. Localities: 0 = Lagos Island; 1 = Maryland; 2 = Ikeja; 3 = Ikoji; 4 = Benin City; 5 = Warri; 6 = Ughelli; 7 = Yenagoa; 8 = Ahoada; 9 = Port Harcourt; 10 = Bonny Island; 11 = Aba; 12 = Ikot-Ekpene; 13 = Eket; 14 = Calabar.

statistically significant differences between species ( $P < 0.001$ ,  $\chi^2$  test with  $df = 1$ ) in terms of frequency of individuals trapped in the various habitats. In particular, brown rats were captured essentially in rubbish dumps (43.3% of the total sample) and in food markets (40.6%), whereas most of the *R. rattus* sample was taken in food markets (79.6%) (Fig. 2). No specimens of either species were captured in natural or semi-natural habitats of altered forests.

The numbers of trapped brown rats, divided by habitat and season, are given in tab. 2. There was a considerable excess of specimens ( $P < 0.05$ ,  $\chi^2$  test with  $df = 1$ ) captured in dry season only in two localities (one with rubbish dump and one with food market), whereas there were no inter-seasonal differences in the other areas. In addition, these rodents were not seen or trapped in villages situated inside forest blocks, whereas *Rattus rattus* may be sometimes observed in that type of habitat (Angelici et al., 1999).

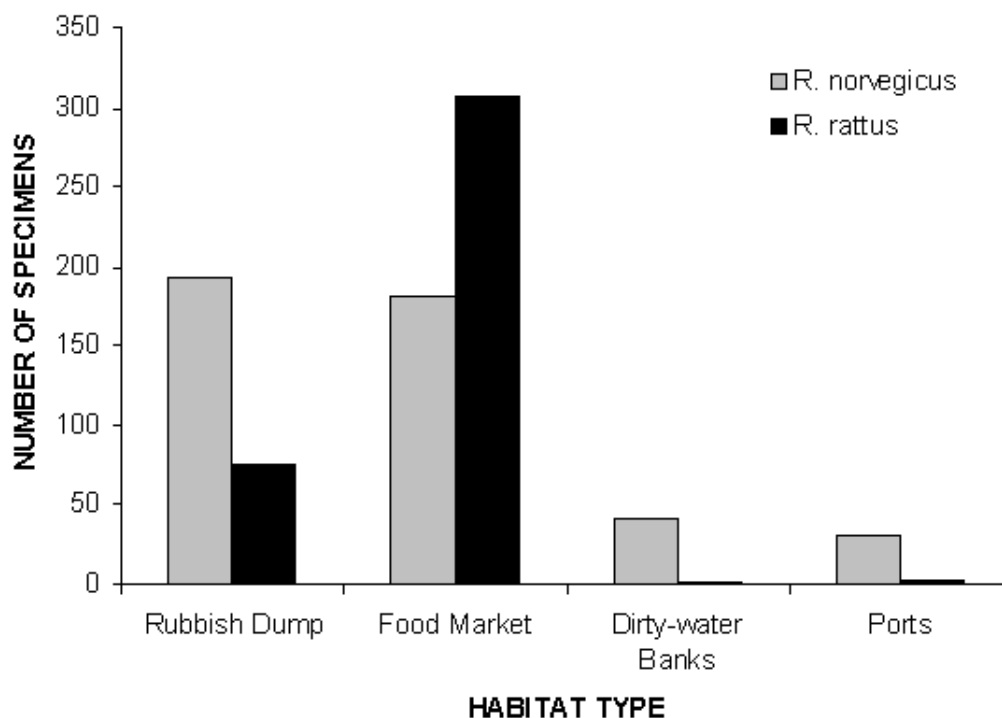
Body measurements taken from some brown rat specimens captured in Nigeria are presented in tab. 3. Based on these very preliminary data, the body measurements of Nigerian brown rats are relatively similar to those of their European conspecifics (cf. Toschi, 1965; Becker, 1978). However, more data are needed to be sure.

## DISCUSSION

According to Rosevear (1969) and Happold (1987), the apparent rarity of the brown rats in Nigeria is probably due to the absence of swampy regions, sewers, and drains where the habitat is cool and moist. In our opinion this hypothesis is not supported by facts, because southern Nigeria is characterized by a almost continuous mosaic of streams and marshes, and presents a lot of swampy regions. On the contrary, there are very few sewers and drains, whereas, at present, sewage, and irrigation and draining channels are increasingly widespread, although with casual and sporadic control. These factors will certainly favour the brown rats range expansion in Nigeria over the next years.

Number of reference in fig. 1	Locality	Macro-Habitat
0	Lagos island, Lagos state	Urban habitat (slums, cellars, canteens), channels, lagoons
1	Maryland, Lagos State	Urban habitat (rubbish dumps)
2	Ikeja, Lagos State	Urban habitat (slums, cellars)
3	Ikoji, Lagos State	Urban habitat (rubbish dumps)
4	Benin city, Edo State	Urban habitat (food markets)
5	Warri, Delta State	Urban habitat (food markets)
6	Ughelli, Delta State	Urban habitat (rubbish dumps)
7	Yenagoa, Bayelsa State	Urban habitat (food markets)
8	Ahoada, Rivers State	Urban habitat (slums, food markets, houses)
9	Port Harcourt, Rivers State	Urban habitat (slums, food markets, canteens, channels, river banks, port)
10	Bonny Island, Rivers State	Urban habitat (food markets)
11	Aba, Abia State	Urban habitat (food markets)
12	Ikot-Ekpene, Akwa-Ibom State	Urban habitat (food markets)
13	Eket, Akwa-Ibom State	Urban habitat (food markets)
14	Calabar, Cross River State	Urban habitat (food markets, channels, river banks, port)

**Tab. 1** List of some localities where *Rattus norvegicus* was recorded and/or trapped, including a general description of the macro-habitat of observation. Data presented in this table were collected during opportunistic trapping sessions which were done at several areas of southern Nigeria



**Fig. 2** Ecological distribution of *Rattus norvegicus* and *Rattus rattus* in the Port Harcourt area of southern Nigeria, as revealed from systematic trapping sessions.

Marine base dump (Port Harcourt) Rubbish dump		Diobu market (Port Harcourt) Food market		Mile Two (Port Harcourt) Dirty waters		Marine beach (Port Harcourt) Port		Rumuosi (Port Harcourt) Altered forest-farmland	
Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season	Dry season	Rainy season
111	82	105	76	23	18	14	17	-	-

**Tab. 2** Numbers of brown rats captured in relation to season and habitat type in the Port Harcourt area of southern Nigeria, during sessions of systematic trapping (see text).

Specimen	Sex	Age	Locality (date)	HBL	EL	HFL	TL	BM
14.L	male	adult	Lagos Island (April 1997)	212.5	19.5	41.5	167.0	302.5
3.I	male	adult	Ikeja (June 1997)	237.5	21.5	42.0	181.5	352.5
4.I	male	sub-adult	Ikeja (June 1997)	134.0	17.0	38.0	133.5	87.0
7.Y	female	adult	Yenagoa (August 2001)	243.0	20.0	42.0	201.5	363.5
2.PH	female	adult	Port Harcourt (August 2001)	208.5	18.5	41.0	179.5	274.0
5.PH	male	sub-adult	Port Harcourt (August 2001)	166.0	17.5	38.5	149.0	94.5
1.E	male	adult	Eket (November 2000)	248.5	22.0	43.5	211.5	374.0
6.C	female	sub-adult	Calabar (March 2000)	122.0	16.5	36.0	128.5	64.5

**Tab. 3** Body measurements of some *Rattus norvegicus* from Nigeria (specimens stored in the authors' collections). HBL = Head and body length (mm); EL = Ear length (mm); HFL = Hindfoot length (mm); TL = Tail length (mm); BM = Body mass (g).

Rosevear (1969) claimed that *R. norvegicus* has likely a great intolerance of a tropical climate, and that port towns in West Africa do not offer available habitat for brown rats because they are built on the edge of swamps, and on ground not much above the water table. According to Rosevear's claims, this situation

would not allow the brown rats to making their home in holes burrowed into the banks; nonetheless rats are usually common in ports and their surroundings.

Our data showed that brown rats are not really intolerant of tropical climate, because their current presence is not only much wider than previously

known, but also relatively homogenous along urban environments of the oceanic coasts (Fig. 1). Moreover, the species was also found over 100 km far from the coast, along the main river axes (Fig. 1).

It is noteworthy that brown rats are not always associated to river bodies and wet areas with muddy banks, where the species can dig its galleries (Twigg, 1975). Thus, we suppose that Nigerian brown rat populations could make their nests in cellars, in the foundations of the houses which are not properly closed, and inside garbage dumps. A comparable nest site selection has been previously observed in continental Europe and Great Britain (Becker, 1978; Taylor et al., 1991).

Until now the brown rat was not observed in cultivated lands, rainforests and muddy banks of large rivers outside urban settlements (Happold, 1987; Angelici et al., 1999). The absence of rats from this latter habitat may depend, at least in the coastal river areas, on the substantial tidal oscillations in the water level (nest flooding) or on possible competition with other indigenous species, which may be better adapted to natural and semi-natural habitats. However, these are working hypotheses which need further investigations.

We do not have collected data in sugar cane plantations, which are considered to be elective habitats for brown rats in tropical areas (cf. Twigg, 1975).

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