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## NEW INVASIVE SPECIES IN SOUTHERN FLORIDA: GAMBIAN RAT (*CRICETOMYS GAMBIANUS*)

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On 17 August 2004, 5 Gambian rats (*Cricetomys gambianus*; 2 males and 3 females) were collected on Grassy Key, Florida. Evidence obtained from this collection confirms the existence of the 1st North American established and reproducing *Cricetomys* population. This invasive rodent population could represent a new series of ecological threats to the native and endemic flora and fauna of southern Florida.

Key words: *Cricetomys*, Florida Keys, Gambian rat, invasive species, zoonoses

Invasive species have contributed to the extinction of many native and endemic species (Atkinson 1989; Simberloff 2001; Vitousek 1988). Island species are particularly vulnerable, because many insular endemic species evolved in the absence of the predation and diseases that often accompany invasive species (Blumstein 2002; Dowler and Carroll 1996; Dowler et al. 2000). Historically, the shipping industry was a significant facilitator of species invasion, most notably spreading members of the genera *Rattus* and *Mus* around the globe. Recently the exotic pet trade has provided an additional avenue for the introduction of exotic animals and many of these species can establish populations if accidentally or intentionally released.

In South Florida, the list of invasive animals includes vertebrate taxa such as common mynas (*Acridotheres tristis*), Burmese pythons (*Python molurus bivittatus*), green iguanas (*Iguana iguana*), feral cats (*Felis silvestris*), and roof rats (*Rattus rattus*), the latter having been present for more than 200 years (dePourtales 1877). Little is known regarding the effect these and other exotic species have had on the local biota (Forys et al. 2002; Goodyear 1992). As recently as 1999, 8 Gambian rats (*Cricetomys gambianus*) purportedly escaped from the pen of an exotic pet breeder on Grassy Key, Florida

(D. Setton, pers. comm.). Wildlife management agency personnel were not aware of this release or of sightings by local residents until a local resident contacted the United States Fish and Wildlife Service in the spring of 2004. Since the initial introduction, residents of this area have reported a steady increase in the frequency of Gambian rat sightings (Grassy Key residents, pers. comm.).

Gambian rats are 1 of 2 species in the genus *Cricetomys* currently recognized by most researchers. These 2 species, *C. emini* and *C. gambianus*, are among the largest members of the rodent family Muridae and are phenotypically similar. However, most forms of *C. gambianus* can be distinguished by the indistinctly defined venter (compared to the distinct white- or cream-colored venter of *C. emini*), dark eye ring, and hairy ears as compared to forms of *C. emini* (Rosevear 1969). Male Gambian rats are larger than females, achieving weights as high as 2.8 kg (Rosevear 1969). Gambian rats are omnivorous and are reported to consume vegetables, insects, crabs, snails, palm fruits, and palm kernels (Ajayi 1975). Members of this genus have been linked to several potentially pathogenic zoonoses (leptospirosis, bartonellosis, and trypanosomiasis), including monkeypox, which was introduced into the United States in 2003 (Centers for Disease Control and Prevention 2003; Gretillat et al. 1981; Herder et al. 2002; Hutin et al. 2001; Machang'u et al. 2004). Gestation times for *C. gambianus* range from 27 to 42 days and litters consist of 1–5 young; thus, members of the genus *Cricetomys* must be considered highly fecund (Ajayi 1975; Hayssen et al. 1993;

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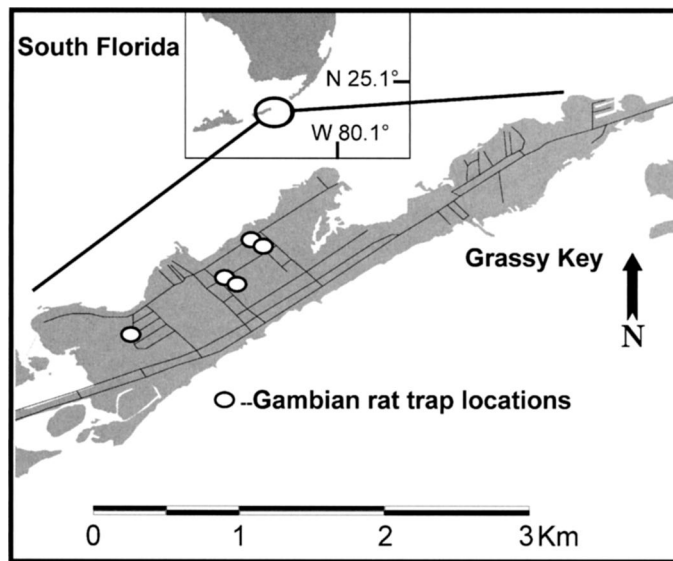


FIG. 1.—Location of collection sites for Gambian rats in August 2004, Grassy Key, Florida.

Rosevear 1969). Given their large body size, high fecundity, and omnivorous diet, these rats pose a serious and potentially long-term threat to the indigenous ecological communities within the Florida Keys. Herein, we report the discovery of the 1st population of Gambian rats in North America.

## MATERIALS AND METHODS

Grassy Key is located approximately 40 km south of the southernmost tip of mainland Florida, near the midpoint of the Florida Keys archipelago. A 1-night survey (Universal Transverse Mercator coordinates 503989 2738463; Fig. 1) was conducted on 17 August 2004. A total of 70 live box traps (various sizes and manufacturers) were baited with peanut butter, oats, and cracked corn. Trapping occurred on private properties with the permission of local landowners. Animal collections were done in accordance with the standard guidelines established by the American Society of Mammalogists (Animal Care and Use Committee 1998). The rats were sedated with Telazol (Fort Dodge Laboratories, Fort Dodge, Iowa) and visually inspected for ectoparasites. Blood samples were drawn via cardiac puncture and the rats were euthanized with sodium pentobarbital. Sex and reproductive status were noted, and weight and standard measurements were taken at the time of collection. Upon necropsy, additional notes were taken and additional specimens were collected and archived at the Centers for Disease Control and Prevention in Atlanta, Georgia. Serum was collected for serological assays for antibodies to orthopoxviruses (e.g., monkeypox). A standard enzyme-linked immunoabsorbent assay was used to screen animal sera for the presence of orthopoxvirus-specific (immunoglobulin) antibodies as evidence of exposure to members of the genus *Orthopoxvirus* (Karem et al. 2005). This testing was performed because of the previous importation of monkeypox into North America in 2003 with a shipment of African animals that included individuals of this *Cricetomys* species.

## RESULTS

We collected 5 Gambian rats (2 males and 3 females). All 3 of the females had evidence of past reproductive events (i.e.,

vagina open and nipples used); 1 male was reproductively active, whereas the other was a juvenile. Additionally, 1 of the females had highly developed mammary tissue and external evidence of recently nursing at least 1 litter. The weights of adult rats were 1.0–1.4 kg (the adult male was the largest) and the juvenile male weighed 0.5 kg. Total lengths of the animals were 672–790 mm for males and 699–735 mm for females. Tails measured 372–400 mm for males and 374–405 mm for females. Ear lengths were 36–41 mm. Right hind foot measures were 62–76 mm. The results of the serology assays indicate a lack of antibodies reactive with *Orthopoxvirus*.

## DISCUSSION

Gambian rats are a new threat to the native and endemic faunal elements of the Florida Keys. The Key Largo woodrat (*Neotoma floridana smalli*), Key Largo cotton deermouse (*Peromyscus gossypinus allapcticola*), Lower Keys marsh rabbit (*Sylvilagus palustris hefneri*), Stock Island tree snail (*Orthalicus reses*), and silver rice rat (*Oryzomys palustris natator*) are all endemic fauna that are federally listed as endangered or threatened by habitat destruction, feral cats, or other impacts of human development (Barbour and Humphrey 1982; Forsy 1995; Goodyear 1992; United States Fish and Wildlife Service 1999; Vitousek 1988). Insular species are particularly vulnerable to the effects of introduced rodents, which have been known to cause rapid declines in or extinction of both native and endemic species (Dowler et al. 2000). Given their size, fecundity, and omnivorous diet, Gambian rats could be a significant obstacle for endangered species recovery in the Keys and South Florida, increasing both predation and competition with endemic species.

The genus *Cricetomys* has been linked to several zoonoses, including at least 1 infectious viral disease (monkeypox—Drake 2005; Hutin et al. 2001). Serological testing of serum from individuals collected in this study indicates a lack of exposure to any known member of the genus *Orthopoxvirus*. Additionally, the entire population was presumably born in the Florida Keys, thus we can assume the risk of a monkeypox introduction from these individuals is minimal. Nonetheless, the introduction of other foreign diseases could threaten the native ecosystem and human health because many zoonotic pathogens have a broad range of permissive hosts in which they can be highly virulent.

The Florida Keys are geographically isolated and have large dispersal barriers, including a 5-mile-long bridge, which provide an opportunity to prevent expansion of the Gambian rat population to mainland Florida. Surveys to determine the range of this population should coincide with an eradication effort. The consequences of a mainland invasion of these rats are difficult to predict, although risks to the Florida agriculture industry from a large, largely frugivorous rodent are intuitive. Recent models predict the colonization potential of *Cricetomys* in North America (see Peterson et al., in press). These data are the 1st to confirm the establishment of a free-ranging population of *Cricetomys* in North America. The introduction of any exotic rodent can threaten native ecosystems, agricultural

industries, and human health (Perrings et al. 2000). Through either accidental escape or intentional release by owners, exotic animals have become established throughout South Florida. The consequences of most of these introductions are currently unknown and research is needed to reveal ecological dynamics and risks posed to human interests. Regardless if this population remains restricted to the Florida Keys or does disperse to the mainland, the potential for negative ecological or economic effects is evident.

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