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Abnormal Eggs of Rio Grande Wild Turkeys on the Edwards Plateau, Texas

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ABSTRACT.—We studied the reproductive ecology of Rio Grande Wild Turkeys (*Meleagris gallopavo intermedia*) in the Edwards Plateau region, Texas during 2005 and 2006. Runt eggs from a single adult female were observed through three nesting events over 2 years. Mean mass and volume for the runt eggs were 44% of normal Wild Turkey eggs. Production of runt eggs is common in domesticated gallinaceous birds, yet little information is available on runt egg production in wild gallinaceous birds. To our knowledge, our observations are the first which indicate runt egg production occurs in Wild Turkeys. *Received 20 February 2007. Accepted 11 May 2007.*

Knowledge of reproductive rates is critical to monitoring long-term dynamics of Wild Turkey (*Meleagris gallopavo*) populations (Vangilder 1992). Reproductive rates are influenced by multiple components of the reproductive process. Runt eggs, those having volumes <75% of the average (Koenig 1980), are perhaps the most common egg abnormality documented in domestic fowl (Pearl and Curtis 1916, Romanoff and Romanoff 1949). Several avian species, both domestic and wild, have been known to produce runt eggs (Hernandez et al. 2006), but occurrence is low for most species; approximately one in every 1,000–2,000 eggs (Mallory et al. 2004, Hernandez et al. 2006). Documentation of runt eggs in wild populations is rare (Rothstein 1973, Mallory et al. 2004). Our objective is to report what we believe is the first observation of runt egg production by Wild Turkeys.

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OBSERVATIONS

We tracked, via triangulation and homing (White and Garrott 1990), 11 radio-marked Wild Turkey hens through two nesting seasons (2005–2006) on a 984-ha ranch ~9.5-km north of Leakey, Texas, USA. One of these radio-marked hens produced runt eggs during three consecutive nesting attempts (2 in 2005, 1 in 2006). We captured this 3.7-kg hen on 24 February 2004 as an adult (≥ 18 months of age). She produced a clutch of five eggs in 2004 with no abnormal appearing eggs.

We first observed a set of runt eggs on 13 April 2005 during the hen's initial 2005 nesting attempt. The first nest contained three runt eggs and one normal egg. Normal laying behavior for turkeys is to lay one egg per day (Healy 1992). Daily checks when the hen was off the nest confirmed that no additional eggs were laid until 18 April when one additional runt egg was laid (total clutch; four runt eggs, one normal egg). We continued to monitor the nest daily from 18 to 27 April during which time we did not locate the hen on the nest although she was located in the nest area. We observed one additional runt egg, on 28 April, bringing the clutch size to six (five runt eggs and one normal egg). One additional runt egg was deposited between 28 April and 1 May bringing the total clutch to seven (six runt eggs and one normal egg). The normal-sized egg was depredated on 2 May and only six runt eggs remained. We considered the nest depredated on 4 May when the remaining eggs were found hidden under leaf litter (undamaged) in separate locations away from the nest. We collected the runt eggs, measured size and volume, and ascertained if they were viable.

We continued to radio-track the hen and documented a second nesting attempt on 30 May 2005 containing three runt eggs. During

TABLE 1. Characteristics of normal and runt Rio Grande Wild Turkey eggs on the Edwards Plateau, Texas, 2005–2006.

	<i>n</i>	Min	Max	Mean	SD
Normal					
Length, mm	176	53.4	65.6	61.0	0.19
Width, mm	176	40.7	72.0	47.1	0.24
Weight, g	176	47.4	85.1	68.7	6.46
Volume, ml	161	27.5	55.0	43.6	4.62
Runt					
Length, mm	7	39.2	49.5	44.7	0.39
Width, mm	7	33.4	37.5	35.5	0.17
Weight, g	7	23.6	34.2	30.3	3.79
Volume, ml	4	16.5	22.0	19.3	3.18

monitoring of the renesting attempt, the hen abandoned the nest. Within 1 week she was located >1 km from the nest and was not observed near the nest again. We collected the three runt eggs on 9 June 2005 to check viability and to obtain measurements. We documented a third nest the following year by this hen on 19 April 2006, which contained 12 runt eggs and four normal eggs. We monitored the nest and hen daily through 14 days of incubation, and found the nest partly depredated on 3 May 2006. We collected shell remains from 10 depredated eggs (eight runt and two normal eggs).

We located 90 nests from 69 individual hens during 2005–2006 and obtained clutch sizes for 70 nests ($n = 885$ eggs). Based on our data, runt eggs in Wild Turkeys occurred at a frequency of 2.4% (21/885). We measured length (mm), width (mm), mass (g), and volume (ml) using water displacement for undamaged runt eggs ($n = 7$) and undamaged/unhatched normal eggs ($n = 176$) collected during 2005–2006 (Table 1). Mean mass and volume of the runt eggs was 44% of normal eggs; 31% smaller than the suggested size for classifying eggs as runts (Koenig 1980). None of the runt eggs contained yolks, making them unviable.

DISCUSSION

Production of runt eggs is usually thought to be caused by a temporary disturbance to the reproductive system (Pearl and Curtis 1916, Romanoff and Romanoff 1949). Moreover, birds under environmental stress may be

more prone to produce runt eggs (Mallory et al. 2004). Wild Turkey reproduction and, therefore, egg production is negatively affected by low rainfall and soil moisture (Beasom and Pattee 1980) as well as nutritional limitation (Blankenship 1992). Continued production of runt eggs suggests a congenital defect or permanent injury to the bird's oviduct (Pearl and Curtis 1916, Mulvihill 1987). The frequency of runt eggs in Wild Turkeys is low; persisting environmental stresses presumably could alter their frequency and reduce the potential production of the population. However, the low prevalence of runt eggs in our study suggests the impact of runt egg production on population trajectory is probably limited.

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Barred Forest Falcon (*Micrastur ruficollis*) Predation on Relatively Large Prey

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ABSTRACT.—We describe three successful predation events by the Barred Forest Falcon (*Micrastur ruficollis*) in the Atlantic Forest of coastal southeast Brazil. The prey items were a Plumbeous Pigeon (*Pta-gioenas plumbea*), a Brown Tinamou (*Crypturellus obsoletus*), and a large toad (*Chaunus ictericus*). This is the first report of successful attacks on prey heavier than the forest falcon, of which none was successfully carried away. These large prey items represent a trade-off between high nutrient value and safety of carrying prey to a secure perch. *Received 16 November 2005. Accepted 23 July 2006.*

The Barred Forest Falcon (*Micrastur ruficollis*) is a small neotropical falconid weighing an average of 168 g for males and 233 g for females (Thorstrom 2000). It lives in dense primary or secondary forest where it is known to feed on a variety of small vertebrates and large invertebrates (Sick 1993). Studies of its diet are few (del Hoyo et al. 1994), the most detailed of which (405 prey identified) found reptiles to be the most important group, in terms of frequency, followed by birds. However, both were equal in bio-

mass captured and delivered to nests during the breeding season (Thorstrom 2000). There is one example of predation on a hummingbird (Nunnery et al. 2002) and fruit consumption has been reported (Thorstrom 1996). Hilty and Brown (1986) reported the forest falcon is believed to specialize mostly on small birds, but are not specialists on them (Thorstrom 2000).

Forest falcons are regularly captured in Amazonian forest mist nets attacking small birds already caught in the nets (Mario Cohn-Haft, pers. comm.). They also follow swarms of army ants at times, presumably hunting either fleeing insects or other birds that follow the ants (Willis et al. 1983). The largest prey described weighed 160 g, roughly the minimum weight of the predator (Thorstrom 2000). We describe three cases in the Brazilian Atlantic rainforest of *M. ruficollis* successfully taking prey larger than itself, and briefly discuss the implications for the foraging and breeding ecology of the species. The bird prey weights were obtained from Sick (1993, 1997).

OBSERVATIONS

All of our observations were by chance, during the day, in the course of other research in the Brazilian State of São Paulo. The three sightings possibly involve three different individuals, based on the distances between sites of at least 3 km. The three observations were on dirt roads among patches of eucalyptus (*Eucalyptus saligna*) plantations and Atlantic forest on private farms (23° 55' S, 47° 41' W)

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at an altitude of 650–980 m in the Serra do Mar coastal mountain range.

We observed a forest falcon in May 2001 on the ground eating a Plumbeous Pigeon (*Patagioenas plumbea*), the breast of which was already mostly consumed. The falcon flushed on our approach trying unsuccessfully to carry the prey, which it dropped after dragging it for 1 m. This pigeon has an average weight of 231 g. We observed another forest falcon in January 2002 on the ground eating a large toad (*Chaunus ictericus*). Adult males of this toad species, approximately the size we observed, weigh 200–250 g (A. P. Antunes, pers. obs.). The raptor was eating from the throat region, possibly avoiding the area of the paratoid glands.

In August 2003 we encountered a falcon on the ground stripping the neck feathers from a live Brown Tinamou (*Crypturellus obsoletus*; weight 480 g). The forest falcon was grasping the tinamou's dorsum and flapping the wings slightly. The prey showed no external evidence of injury but, after the forest falcon released it, the tinamou remained on its back, apparently unable to move. The raptor flushed upon our arrival trying to carry the prey, which it was unable to move.

One additional observation occurred at approximately sea level at Itamambuca Beach, Ubatuba Municipality, in October 2003. A Barred Forest Falcon landed on a perch 1 m above the ground and 1.5 m from a large terrestrial Black-white Tegu (*Tupinambis merrianae*), which we had been observing. This lizard was ~1 m in length (including tail) and weighed ~1.0–1.5 kg (A. P. Antunes, pers. obs.). The hawk watched the lizard closely and flushed after noticing our presence.

DISCUSSION

The possibility of vehicle strikes was discarded in the predation events because: (1) the Plumbeous Pigeon predation site can not be accessed by car, (2) only our vehicle was allowed on the farm in the case of the tinamou, and (3) no signs of flattening of the toad were observed.

Other reports of toad predation by hawks have included a White-tailed Hawk (*Buteo albicaudatus*) eating just the legs of *Chaunus marinus* (Sick 1997) and a Red-tailed Hawk

(*B. jamaicensis*) preying on *Anaxyrus boreas* (Jones and Stiles 2000).

Our observations describe predation by Barred Forest Falcons on two different animal classes (birds and amphibians), reinforcing the importance of these groups in its diet. This is the first report of successful attacks by *M. ruficollis* on prey heavier than 160 g. Thorstrom (2000) documented maximum weight of prey based on estimated weight of items taken and delivered to nests by breeding forest falcons. Prey items must be sufficiently light for the adult to carry in flight. We documented captured prey as much as twice the weight of a Barred Forest Falcon. None of these larger prey items could be carried by the forest falcon suggesting the threshold weight for carrying is roughly that of the falcon. Thorstrom (2000) reported the Collared Forest Falcon (*Micrastur semitorquatus*) (average body mass for females = 869 g) captured an Ocellated Turkey (*Meleagris ocellata*) weighing 3 kg which represented ~3.5 times the body mass of the female forest falcon. This female fed and stayed near this kill for several days, and later carried pieces of the carcass to the nest where she was attending two nearly-fledged nestlings (Russell Thorstrom, pers. comm.).

These observations suggest that predation on considerably larger prey may not be uncommon when forest falcons are not associated with nesting, when pieces of the carcass are carried to the nest. The risk of preying on animals that must be consumed *in situ* may be compensated by the obviously greater nutrient value these prey represent.

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