

Fla. Field Nat. 19(3): 83-84, 1991.

## AGONISTIC BEHAVIOR OF RUDDY TURNSTONES TOWARD SHORT-BILLED DOWITCHERS FORAGING FOR HORSESHOE CRAB EGGS

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Ruddy Turnstones (*Arenaria interpres*) may be highly aggressive toward other species of shorebirds, including the Short-billed Dowitcher (*Limnodromus griseus*) (Burger et al. 1979), but agonistic behavior of turnstones toward dowitchers at specific foraging sites is not well documented. Turnstones are opportunistic foragers and may use many feeding methods (Beven and England 1977, Groves 1978, Cramp and Simmons 1983, Collins and Thomas 1984, Donoghue et al. 1986). In this note, I document a foraging behavior of the Ruddy Turnstone whereby one turnstone repeatedly supplanted Short-billed Dowitchers foraging for horseshoe crab (*Limulus polyphemus*) eggs.

I observed Ruddy Turnstones and Short-billed Dowitchers foraging among a mixed-species flock of shorebirds on wet sand flats on the Gulf of Mexico at Lanark Island, Franklin County, Florida, on 26 April 1990. Two turnstones foraged among approximately 30 dowitchers, one Black-bellied Plover (*Pluvialis squatarola*), several Willets (*Catoptrophorus semipalmatus*), and several species of smaller shorebirds. One turnstone repeatedly evicted the other foraging turnstone and supplanted foraging dowitchers, but was not aggressive toward the remaining shorebirds. Dowitchers, unlike turnstones, probed the full length of their bills into the sand. The more aggressive of the turnstones repeatedly peered into dowitcher probe-holes. At least 40 times this turnstone supplanted a dowitcher immediately after the dowitcher bored a hole. I did not see this turnstone take food directly from the dowitchers. Few dowitchers attempted to reclaim their probe-holes and none that attempted this was successful. The turnstone usually peered into the hole and then left promptly. However, at least 10 times, the turnstone dug into the holes to depths of 4 cm and twice the turnstone fed on small clumps of horseshoe crab eggs at two excavated probe-holes. When not supplanting dowitchers from their probe-holes, the turnstone excavated in undisturbed sand to depths of 2.5 cm. After observing the birds 1 h, I flushed all shorebirds from the sand flat and scooped out 50 spoonfulls of sand to the depth of 6 cm; three samples contained small clumps of *Limulus* eggs, none located deeper than 4 cm below the surface. No other large prey items were evident in these samples.

Both Ruddy Turnstones and Short-billed Dowitchers are known to engage in intra-specific defense of *Limulus* eggs, which are a highly seasonal and valued food source (Mallory and Schneider 1979, Myers and McCaffery 1984, Myers 1986, Sullivan 1986). Turnstones may dig unaided in wet sand for *Limulus* eggs to depths to 10 cm (Myers 1986), yet at Lanark Island, turnstones only dug unaided to a depth of 2.5 cm. When aided by dowitcher probe-holes, turnstones dug to a depth of 4 cm at Lanark Island. Probe-holes of dowitchers undoubtedly facilitated discovery of *Limulus* eggs by turnstones, which rely heavily on vision when foraging (Cramp and Simmons 1983). One turnstone at Lanark Island was able to procure *Limulus* eggs more easily by supplanting dowitchers at their probe-holes. Thus, this turnstone was able to procure a highly seasonal and valued food by using a foraging method not typical of this species.

I thank P. G. Merritt, W. Post, and an anonymous individual for reviewing this note.

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Fla. Field Nat. 19(3): 84-85, 1991.

### COPULATION IN THE MANGROVE CUCKOO (*COCCYZUS MINOR*)

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Although courtship feeding has been described in the Mangrove Cuckoo (*Coccyzus minor*) (Langridge 1990), the copulatory behavior of this species has not been documented. This note describes the vocal and feeding behavior of the female prior to copulation, and the pre-copulatory display and copulation.

I located a pair of Mangrove Cuckoos in Rockland Hammock at John Pennecamp State Park, Key Largo, Monroe County, Florida, on the early morning of 24 May 1990. The fairly open tropical hammock understory allowed uninterrupted observation of the bird's activities. The female cuckoo, whose sex identification was based on observation of later copulatory position, called near the top of a 10 m Wild Tamarind (*Lysiloma bahamense*) at 0645 h. The location of the male at this time was unknown. Without moving, the female continued to call in short bouts of 5-10 querulous guttural notes, at intervals of about 45 s, for 5 min. At 0649 h, she suddenly flew for 15 m, landed, then walked and hopped on the forest floor. The cuckoo appeared to be foraging, but she did not catch anything. She soon returned to the forest canopy where she resumed calling as before.

At 0650 h, the female again returned to the ground and resumed foraging on and very near the forest floor. At 0653 h, she captured a 10 cm long orthopteran. She discarded the wings, then tore off the legs and ate them. Finally, she beat the body of the insect against the ground and pulverized it. She finished eating it at 0657 h. Throughout this feeding bout, the female occasionally emitted subdued guttural calls, 1-2 at a time.

From 0658-0659 h, the female cuckoo rested motionless on the ground. Her breast appeared to be substantially enlarged from the meal, presumably caused by a full crop.