Erratum

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Use of Bank Swallow (*Riparia riparia*) Burrows as Shelter by Common Tern (*Sterna hirundo*) Chicks

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Abstract.—The availability of shelter to avoid predation and ameliorate physiologically stressful conditions is often important to the survival of avian hatchlings. However, as changes in habitat availability force birds to nest in nontraditional locations, young must quickly adapt to using novel sources of shelter. Two Common Tern (*Sterna hirundo*) colonies (one vegetated and one barren) were observed during the 2017 breeding season on a remote island habitat restoration project during data collection for a larger associated study. While chicks within the vegetated colony sought shade under vegetation, those in the barren colony were frequently found under anthropogenically constructed chick shelters. The first reported instance of Common Tern chicks using Bank Swallow (*Riparia riparia*) burrows for shelter was also observed in the barren colony. This behavior, when paired with other similar reports, suggests that this species is able to recognize beneficial shelters, both natural and anthropogenic, and use them at a young age, an important ability if they are to successfully reproduce in atypical habitats. *Received 8 September 2017, accepted 9 December 2017.*

Key words.—Bank Swallow, Common Tern, habitat loss, microclimate, *Riparia riparia*, *Sterna hirundo*, thermoregulation.

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Access to shelter is a basic requirement for almost all wildlife, as appropriate shelter aids in maintaining osmotic balance, thermoregulation, and predator avoidance. For instance, in hot arid conditions, unattended Common Tern (*Sterna hirundo*) chicks often shelter in nearby vegetation to reduce visibility to predators and take advantage of the cooler temperatures within these microclimates. When vegetation is not available, chicks can either make small scrapes in the sand to access the cooler subsurface and rely on cryptic coloration for predator avoidance (Nisbet *et al.* 2017) or use specially designed anthropogenic chick shelters (Burness and Morris 1992). This flexibility is critical for Common Terns as their traditional breeding habitats are dynamic, due in part to tides, floods, and other natural factors (Nisbet *et al.* 2017). However, as climate change and an expanding anthropogenic footprint force avian species into new environments (Hitch and Leberg 2007), the ability to rapidly identify and use novel sources of shelter at early life stages will be critical for successful reproduction. Such behavioral plasticity is especially important for species such as the Common Tern, a species of conservation concern in North America (Cuthbert *et al.* 2003; Morris *et al.* 2012) and one that is known to nest in non-traditional locations (Nisbet *et al.* 2017), including abandoned barges (Custer *et al.* 1986), open dredge sites (Scharf 1978), and navigational structures (Karwowski *et al.* 1995). Here, we report the first documented case of Common Tern chicks using Bank Swallow (*Riparia riparia*) burrows as a source of shelter.

Methods

Study Area

This observation took place on the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island (hereaf-

ter, Poplar Island; 38° 46′ 01″ N, 76° 22′ 54″ W), a restoration site located in the Maryland, USA, portion of the Chesapeake Bay. Popular Island uses clean dredged material from the approach shipping channels leading to the port of Baltimore, Maryland, to rebuild and restore remote island habitat (Erwin *et al.* 2007). Poplar Island provides habitat for over 200 bird species and is one of only two known nesting sites for Common Terns in the Maryland portion of the Chesapeake Bay. In 2017, two distinct Common Tern nesting colonies were observed on the island. The largest colony (composed of approximately 180 breeding pairs; hereafter referred to as the vegetated colony) was located in the northwest corner of the island along a sandy dike bordering a shallow 36-ha fresh/brackish water non-tidal impoundment that receives dredge material annually. The impoundment also receives drainage water from other areas of Poplar Island, as well as rainwater. Vegetative cover within the colony was characterized by increasing densities of switchgrass (*Panicum amarum*, *P. virgatum*), white clover (*Melilotus alba*) and foxtail (*Setaria* spp.) throughout the growing season. The smaller colony (composed of approximately 19 breeding pairs; hereafter referred to as the barren colony) was located primarily on a sandy plateau on the northeast side of the island, approximately 185 m from the vegetated colony. A few of these nests were located approximately 30 m down the plateau toward a sparse patch of foxtail (approximately 160 m^2). Along the vertical face of the plateau, there were approximately 150 abandoned Bank Swallow nests, some of which were accessible from the ground via deposition of windblown sand. Due to exposure to both the elements and predation in this environment, ~15 small wooden A-frame chick shelters (Burness and Morris 1992) were placed in the barren colony.

Surveys

Colony surveys were performed 1-3 times a week from 16 May-7 September 2017 (to ensure coverage of the entire breeding season) as part of an associated project that monitors the breeding success of Common Terns on Poplar Island. Prior to entering the colony to perform nest checks or to collect chicks for banding, observers would survey the area from a distance with spotting scopes to count adult pairs and look for previously banded individuals. It was during these resighting surveys that observers noted the behavior reported. Additionally, temperature data were collected in 12-min intervals via a model UN1TXCA2 Acurite 5-in-1 weather station (Heidenhain Corporation) mounted approximately 1.5 m above the ground within the vegetated colony.

RESULTS

In the vegetated colony, young chicks were regularly found sheltering in vegetation after leaving the nest and along the water's edge upon fledging. In the barren colony, chicks were generally found fully exposed and performing gular fluttering or under chick shelters. On 17 July 2017, one Common Tern chick, approximately 11 days old, was observed sheltering in an abandoned Bank Swallow burrow at the base of the plateau upon which the majority of the barren Common Tern colony is found (Fig. 1). Similarly, two Common Tern chicks, approximately 5 days old, were seen exhibiting the same behavior the next day. Of particular interest was that in all cases Common Tern chicks using Bank Swallow burrows for shelter were found head first within the burrow with their rumps exposed at the burrow entrance. Meanwhile, chicks in the vegetated colony were observed sheltering within the vegetation. Temperatures were especially high on these days, with the weather station reporting temperatures of approximately 30.6 °C and a heat index of 36.1 °C.

DISCUSSION

To our knowledge, this is the first observation of Common Terns using abandoned Bank Swallow burrows for shelter. The previous lack of documentation for such behavior is likely the result of Common Terns not normally nesting in close proximity to abandoned burrows. While Common Terns generally nest on flat islands or beaches with 10-40% vegetative cover (Lamb *et al.* 2014; Nisbet *et al.* 2017), Bank Swallows and many other burrowing birds require steep banks, such as those found naturally around eroded banks and natural bluffs or in anthropogenically manipulated environments such as quarries and road cuts (Garrison 1999). In this instance, the access to Bank Swallow burrows in the barren colony was possible due to: 1) the creation of a steep cliff face during mechanical excavation activity (removal of sand from stockpile); and 2) wind deposition of sand along the cliff face raising the ground level flush with some abandoned burrows. The use of the abandoned burrows was surprising given that they were located farther away than the chick shelters placed throughout the colony, and previous research suggests that chicks are most

Figure 1. The posterior view of a Common Tern chick, aged as approximately 11 days old, using a Bank Swallow burrow for shelter from the sun in a colony without vegetation. Photo by Peter McGowan.

likely to use the shelter experienced in their natal environment when acting out of fear (Burger and Gochfeld 1990). Therefore, we speculate that the observed behavior could be the result of the increased thermal buffering provided by the burrows during the periods of intense heat when these observations were made. Since the burrows extend into the sand bank, they are likely to be cooler than a shelter casting shade onto surface-level sand. However, the burrows may also have been used as protection from predators or to ameliorate other conditions.

While the use of abandoned burrows by Common Tern chicks observed in this study is likely an unusual opportunistic behavior, it does not come without risk. The continued operation of heavy equipment or natural shifting of sand could cause the Bank Swallow burrows to collapse and result in near certain fatality for chicks using those areas for shelter. In addition, the behavior of entering the burrow head first prohibits a chick's ability to see and respond to any predators that may be in the vicinity. Therefore, even when banks or other cutouts are present, we do not recommend the creation of concavities to provide additional shelter; instead, conventional chick shelters would likely provide a lower risk shelter.

Though we believe the use of Bank Swallow burrows as shelter to be novel for Common Terns, the use of unconventional sources of shelter when breeding in atypical habitats is documented for tern chicks of various species. For instance, Bridled Tern (*Onychoprion anaethetus*) chicks have been reported to shelter in Wedge-tailed Shear-

water (*Puffinus pacificus*) burrows (Dyer 1992), and Roseate Terns (*Sterna dougallii*) have been found to nest in rabbit burrows in which hatchlings will subsequently shelter (Spendelow 1982). As changes in climate, land use, and predator and invasive species distributions continue to reduce the amount of traditional breeding habitat available to Common Terns in North America (Cuthbert *et al.* 2003; Erwin *et al.* 2003; Lamb *et al.* 2014), the ability of this species to successfully reproduce in non-traditional habitats will be critical. The opportunistic use of novel sources of shelter by chicks as observed in this and other studies demonstrates the potential for the young of this species to identify and use beneficial habitat features, and thus likely improve their chances of survival.

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ERRATUM

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In the author line Kaitlyn M. Reintsma's last name had a spelling error. The correct spelling is "Reintsma".