

Nesting with Alligators

Some birds achieve predator defense from an unlikely source: more formidable predators.

By Lucas Nell

Despite the “selfishness” typically associated with evolution via natural selection, species can help one another in a variety of ways. One lesser-known type of positive interspecies exchange occurs when one species improves nearby habitat for another species. Known as facilitation, this phenomenon is both ubiquitous and vital: coral reefs provide shelter for countless small fishes and invertebrates; “nurse plants” provide areas of greater shade, moisture, and nutrients for nearby seedlings; and ants influence entire landscapes by protecting *Acacia* trees from grazing elephants. In these examples and many more, facilitation shapes the environmental ranges in which certain animals can live.

One potential form of facilitation is protection from predators. For wading birds—herons, egrets,

storks, spoonbills, and ibis—raccoons and opossums pose a major threat to their nests. Because wading birds have no effective defense against these mammalian invaders, if a raccoon or opossum enters their nest, the adult birds must simply fly off and try their luck laying eggs again next year. Even very small numbers of mammalian predators can cause entire colonies of wading birds (hundreds or thousands of nests) to abandon their offspring. Wading birds would therefore benefit tremendously from enemy-free space.

A peculiar way that some birds seem to gain reprieve from predation is by nesting near an even more aggressive species, one that can keep the mammalian predators out. Of course, nesting near pugnacious animals has its own risks, since the



A roseate spoonbill fishes in the wake of its neighbor.

PHIL LANOUE

same qualities that make them excellent at deterring nest predators also make them dangerous neighbors. An ideal protector would be formidable enough to keep nest predators out, yet incapable of reaching or damaging nests.

In the many wetlands inhabited by wading birds, crocodilians are also common. Naturalists have long observed crocodilians frequently residing under nesting waterbirds, and have speculated that the presence of these rather indiscriminate carnivores might create a moat of protection around the birds nesting above them. During observations of an island colony of birds in Peru, ornithologist Scott Robinson, then at Princeton University, noted, “The only snake I saw swimming near the Cocha Cashu island colony was captured and eaten by a caiman that lived under the colony.” Ecologist Brian Hudgens, then at Duke University, also found that another bird species nested in clusters around crocodile nests in Ghana,

with the presumed benefit that other predators were deterred by crocodile presence. Beyond these anecdotal reports, no one had systematically tested the idea that crocodilians might unwittingly serve as bodyguards for nesting birds.

The Florida Everglades are home to large, mixed-species wading bird nesting colonies, as well as their mammalian nest predators. Here also exists a crocodilian species both large enough to consume a raccoon and common enough for birds to exploit: the American alligator. For decades, scientists have observed alligators’ proclivity for loitering near wading bird nesting colonies, and had posited that alligator presence might act as a deterrent for raccoons and opossums.

Biologist Brittany Burtner at the University of Florida began testing these ideas in 2011. She first used helicopter surveys to look for evidence of alligator presence (e.g., tracks and feces) near tree islands with and without nesting colonies,

in order to determine whether alligators and nesting wading birds frequently lived near each other. She found that alligators occupied ninety-six percent of tree islands with nesting colonies of birds, but only fifty-five percent of those without. Next, Burtner sought to determine whether the birds were attracted to nesting sites near alligators. She set out fake alligators near tree islands and compared numbers of nesting birds to control sites with no alligators. Her fake alligator islands ended up with many more birds nesting on them than control sites. Finally, she placed food bait stations on tree islands and in surrounding canals, and found that when alligators were present at a bait station, raccoons and opossums were absent. Burtner’s results indicated that wading birds prefer alligator-inhabited areas for nesting habitat, alligators might also seek out these birds, and mammalian predators tend to avoid alligators. These findings strongly suggested that birds were benefitting from alli-

gator presence via enemy-free space.

Yet to fully understand how this association evolved and persists, and what effects it might have on the Everglades ecosystem, it is necessary to know how it affects both partners. Along with ecologist Peter Frederick at the University of Florida, I have aimed to determine what benefits, if any, alligators might gain from affiliating with wading bird nesting colonies. We hypothesized that alligators might obtain additional nutrition from four sources: juvenile birds foraging near colonies, increased aquatic prey abundance (e.g., amphibians, invertebrates, and fishes) driven by nutrients from bird guano, nest predators drawn to colonies and intercepted by alligators, and chicks and other material falling from nests directly to alligators. In the thick vegetation of tree islands, it would be impractical to track juvenile birds or survey aquatic prey abundance, and previous evidence that nest predators tend to avoid alligator-inhabited areas indicated that they would probably not constitute a significant source of food for alligators. Thus our goal was to estimate the benefits to alligators from material fallen from nests.

We focused on two forms of nest material: regurgitant and nestling carcasses. All wading birds feed their chicks by regurgitating food to them, and if the exchange is botched—the parent drops the food without the chick successfully grabbing it—that food could be available to alligators. To estimate dropped regurgitant, we placed throughfall traps around great egret nests to catch fish that fell from the nests, and returned every week during the nesting season to collect and measure fish in traps. However, we found that not enough regurgitant falls from nests to form a substantial portion of alligators’ diet.

Wading birds also practice “brood reduction,” where they lay more eggs than they can raise, and neglect



A moorhen nonchalantly steps across an alligator's back.

PHIL LANOUE

a certain number of chicks based on how much food is available that year. By doing so, the adult birds hedge their bets in case a chick dies, and are prepared for the rare occasion that food is so widely available that they can raise more chicks than expected. This behavior results in most nests ejecting one or two chicks per year, which, when considered across a large nesting colony, could create a significant opportunity for nearby alligators.

To estimate the mass of nestling carcasses produced by nesting colonies, we used a dataset of nest surveys maintained by our lab dating back twenty years. During these surveys, researchers marked nests and counted how many chicks were

still alive at each nest every week through the nesting season. From these data we calculated how often and at what age—and in turn, roughly what size—nestlings died, to obtain average nestling-carcass mass per nest. Combining these estimates with the number of wading birds present each year in our study area (1,346 square miles of wetlands just north of Everglades National Park, Florida), we were able to compute how much food, in the form of rejected nestlings, would have been available to alligators. We found that, in prolific years, nestling carcasses alone could sustain most of the breeding female alligators in our study population for much of the dry season.

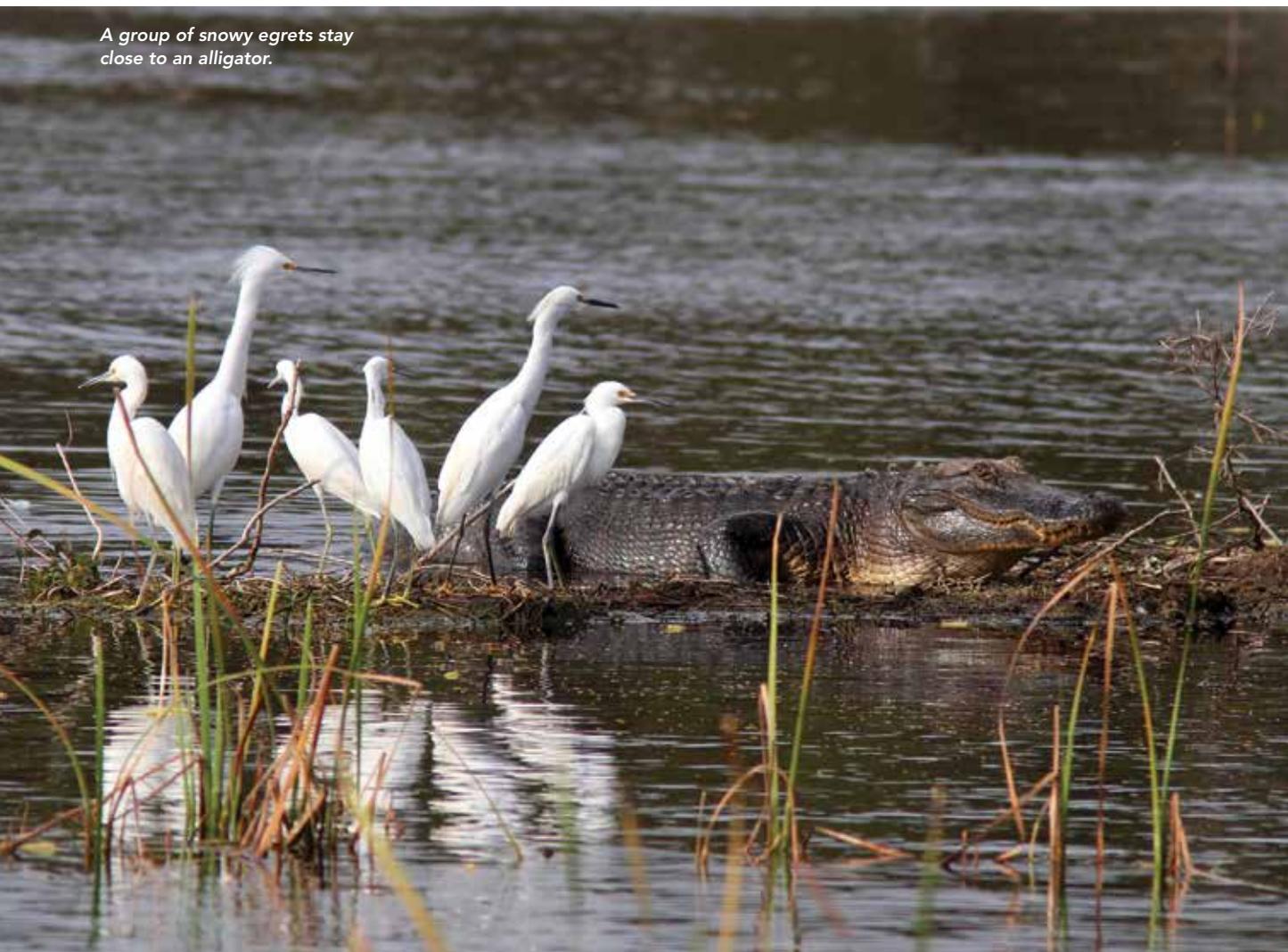
Although we had demonstrated that alligators could potentially receive a substantial amount of nestlings from wading bird nesting colonies, we had yet to show whether this food source actually benefited alligators in the field. Therefore, we next conducted a comparative study of alligator body condition, or health, in relation to the presence of wading bird nesting colonies.

To identify wading bird nesting and non-nesting sites, we conducted monthly aerial surveys over our study area throughout the nesting season, which told us the locations of the conspicuous white wading birds (e.g., wood storks, great egrets, and white ibises). We also conducted airboat surveys dur-



A great blue heron balances risk and potential protection.

NPS/PHOTO/HARRIS



A group of snowy egrets stay close to an alligator.

PHIL LANOUÉ

ing the peak of nesting to detect colonies of darker birds (e.g., little blue herons, tricolored herons, and anhingas). Finally, we used satellite imagery to find tree islands near each nesting colony to use as paired non-colony sites.

Seeking to minimize disturbance to actively nesting birds, we waited until the end of nesting season before assessing the alligators. At each of our focal tree islands, we used nighttime airboat surveys to find alligators. By conducting these surveys at night, spotting alligators was made easier because their eyes glow bright red when a spotlight is shined on them in the dark, the result of an area of highly reflective tissue behind their retinas. If those reflections were within 220 yards of the focal island, we captured the alligator, weighed it, and took length measurements. We were interested in

the mass-to-length ratio, a metric of body condition similar to humans' body mass index.

Our results were unequivocal: alligators near colonies were in significantly better body condition than those in similar habitats without colonies, even when controlling for a range of environmental factors. A six-foot-long alligator was, on average, about six pounds heavier near a colony. Such differences in other species have been shown to yield large effects on reproduction, and nestlings from bird colonies arrive during the period immediately preceding alligators' egg-laying. Nutrition from nesting colonies thus appears to be both substantial and timely, and probably has population-level effects on alligators in the Everglades.

Similar relationships could be globally widespread and ecologi-

cally important. Nesting birds and crocodylians co-occur throughout many subtropical and tropical wetlands, including the floodplains and wetlands of the southeastern United States, Western Australia, India, Africa, the Amazon, the Pantanal, and the Llanos. Crocodylians often play vital roles within their ecosystem by preying upon a vast range of other species, moving nutrients between habitats, and manipulating local sediments through burrowing and nesting activities. Thus facilitation between nesting birds and crocodylians may form a keystone process in many wetlands across the globe.

LUCAS NELL received his master's degree in wildlife ecology at the University of Florida, and currently studies the genomic mechanisms of diverging species. Starting in the fall, he will be pursuing his Ph.D. in zoology at the University of Wisconsin-Madison.