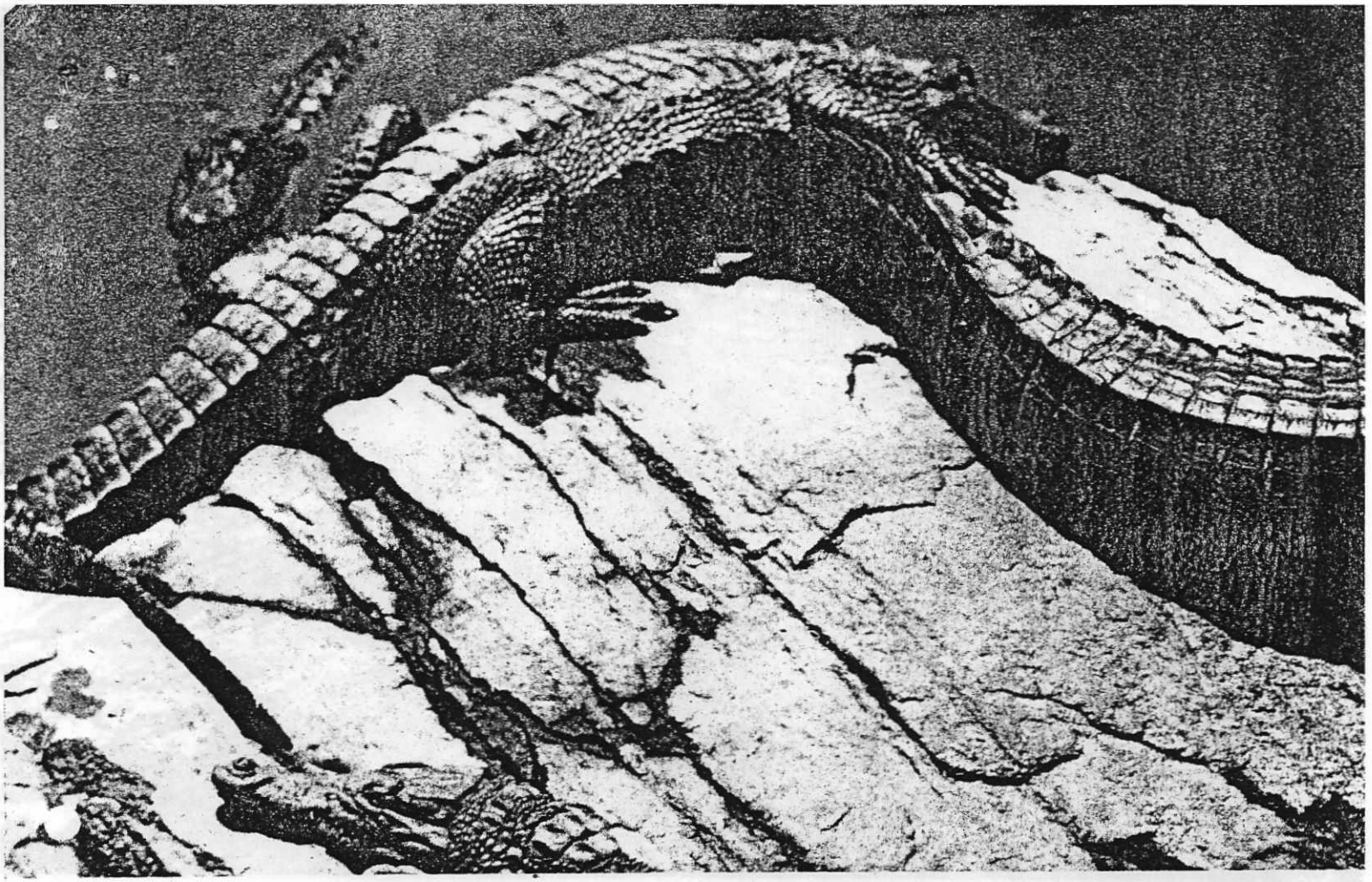
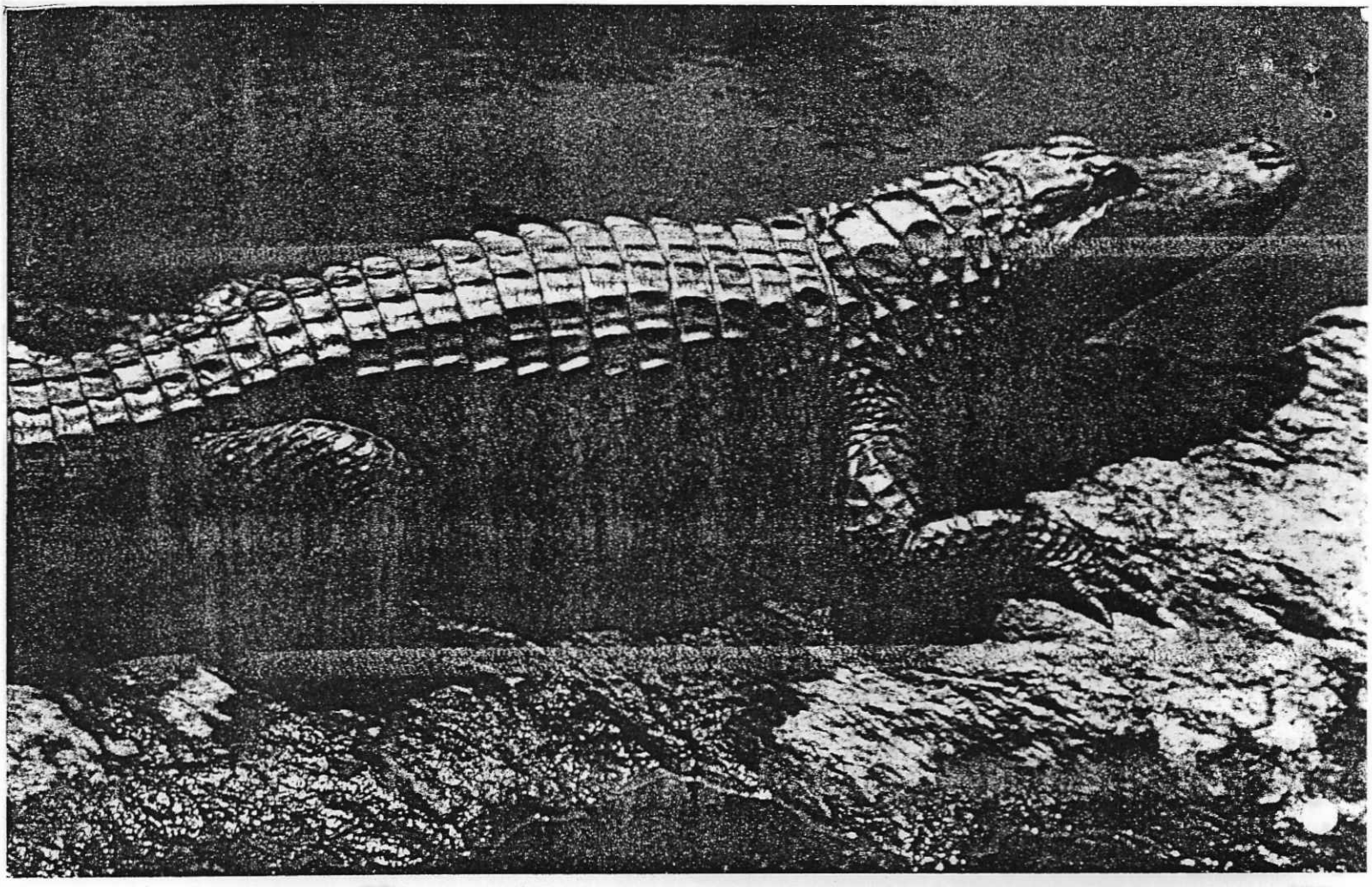


NYZS

# Love Among the Alligators

## Or, how to court a crocodilian

*by Leslie D. Garrick*



*Basking in the sun, American alligators give no hint of the complexity of their social life.*

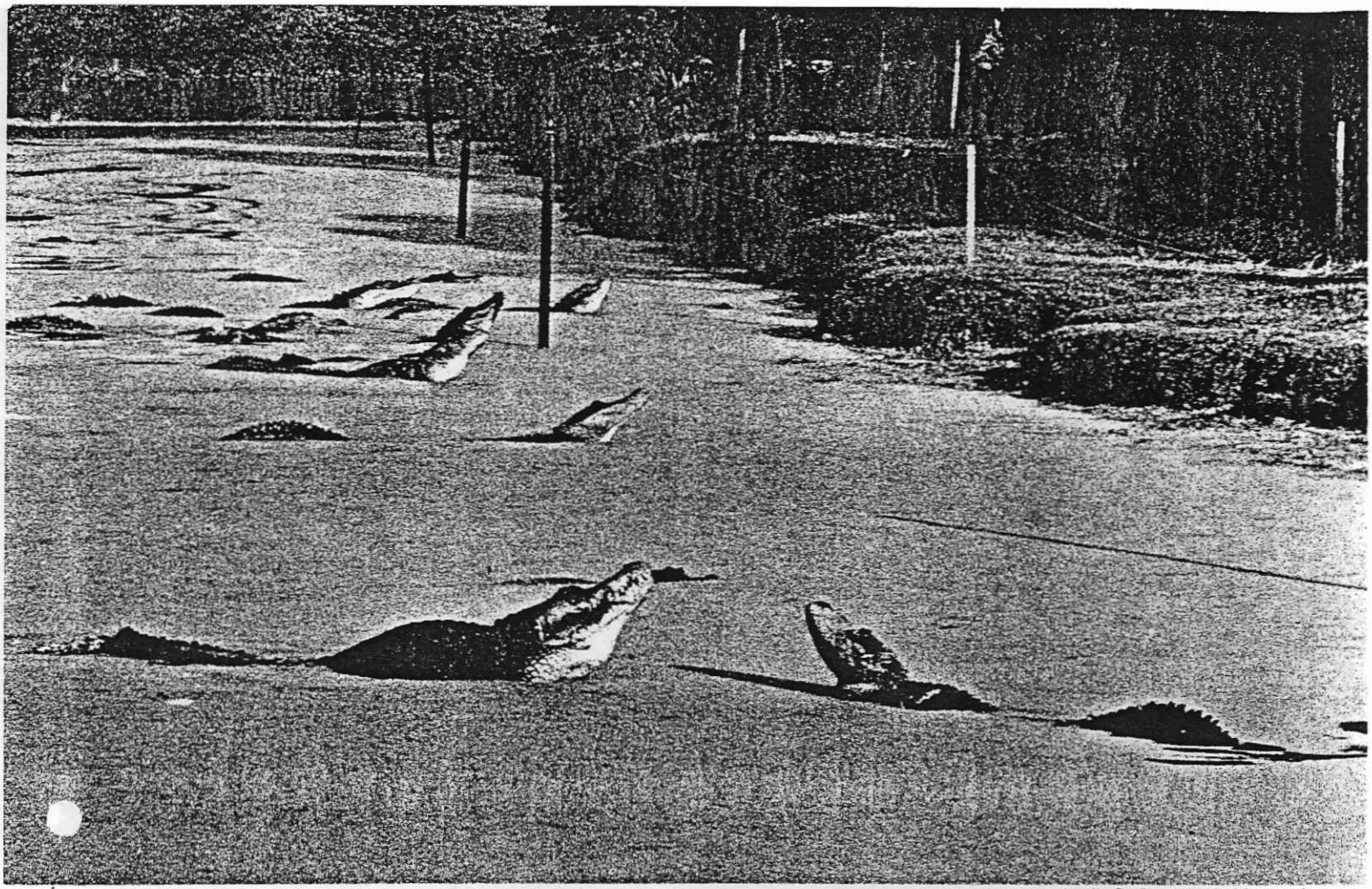
It is no accident that crocodilians have been so poorly studied. For the most part, they are treated as vermin, exploited for the profitable sale of their skins, and eaten for food. What meager information about crocodilian biology we do have is derived from the concern with hide productivity and from management practices in areas where rapidly expanding human populations have come into conflict with these reptiles.

Yet we are, in fact, uncertain of the crocodilians' most common habits. The behavior of rare birds and mammals is better known. For example, even though the American alligator *(Alligator mississippiensis)* is broadly distributed in the southeastern United States and therefore available for concentrated study, a systematic investigation of its behavior has never been made. And the existing information about this species is fraught with contradictions or confused with the behavior of the Nile crocodile of Africa.

If we are to preserve these and other threatened dinosaurian relatives, now is the time to shed some light upon their habits. My decision to study alligator behavior was prompted by our apparent ignorance, the animal's status as an endangered species, and the number of individuals available for study in semi-natural conditions at "alligator farms." It was at one of these farms, Gatorama, in south-central Florida that my colleague, Jeffrey Lang, and I began our study in March, 1974.

A few days after our arrival, I was awakened by a sound so utterly primal that I sat up on the edge of the bed in disbelief. Immediately I ran out of the house to investigate. In the mist-covered lake, I discerned the fuzzy outlines of alligators, their heads pointed skyward at an angle of about forty degrees from the lake's surface. As they shattered the air with bellowing, I could see the water droplets bouncing off their backs from the vibrations.

This was the first of many choruses that spring which heralded the onset of the breeding season. Before our study began, I had postulated several questions about alligator courtship; mainly I sought to identify what kinds of cues or signals alligators might use to locate, to attract, and to keep a mate. Admittedly, I expected this large reptile to possess a rather unassuming social life, and I was somewhat surprised by the complexity and intensity of the interactions that I witnessed and recorded in the weeks ahead.



Leslie D. Garrick, NYZS

*To herald another spring day, the alligators raise their heads and shatter the air with bellowing.*

The events of the breeding season unfold gradually and then quickly build to a crescendo. In this farm lake, 200 yards long and twenty yards wide, inhabited by about thirty-five adult alligators, a distinct dominance hierarchy developed. The establishment of this "pecking order" is based upon the testing of social position with one's neighbors by actual or threatened combat. Such chases and fights provided the most dramatic and intense moments of our entire research.

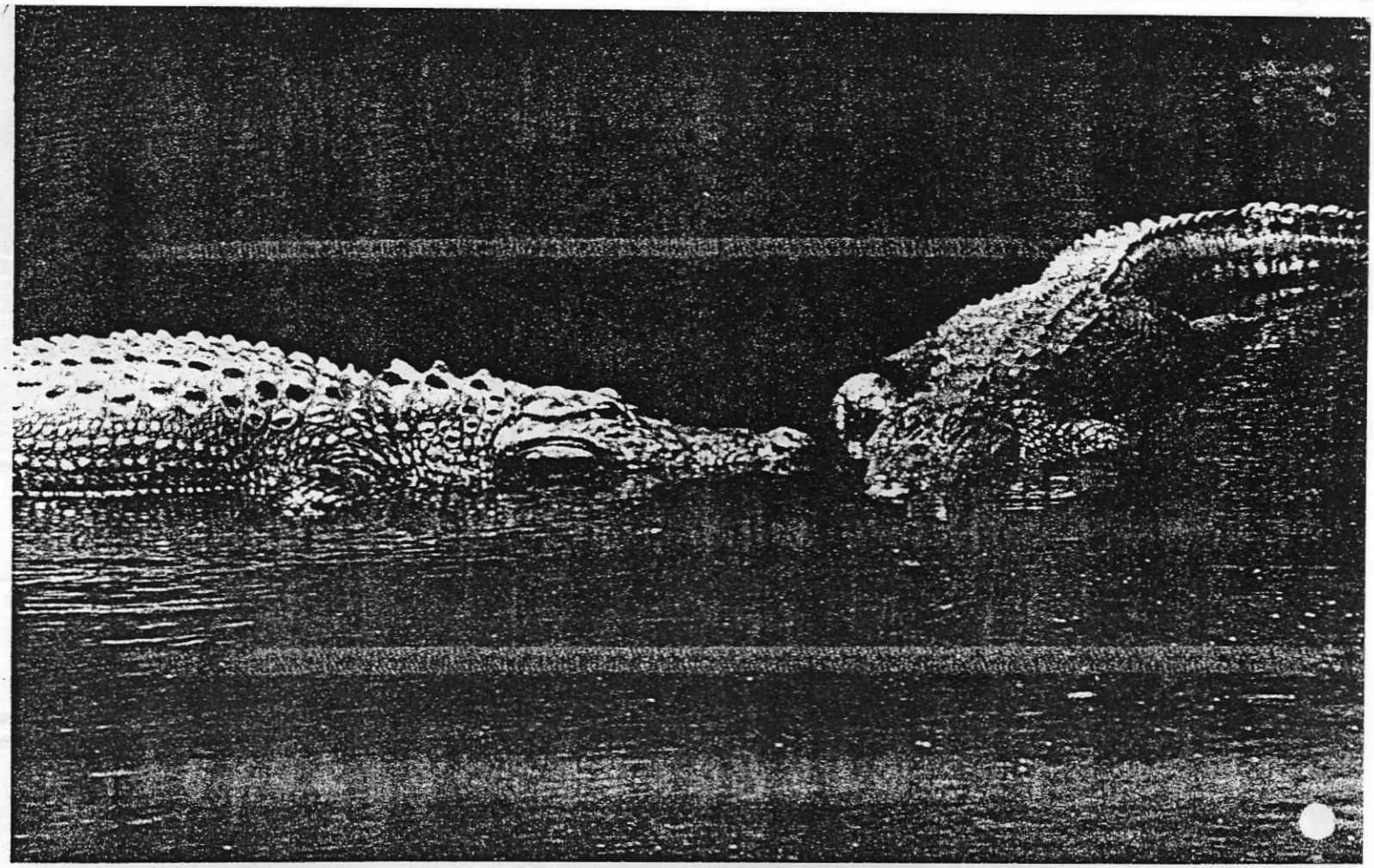
It soon became obvious that "Tumor-tail," a large male with a plate-like lump of tissue on the end of his tail, was boss. He was able to swim anywhere in the lake and to attempt courtship with any female without interference. However, a larger gator, who had been transferred into the lake after the previous breeding season, began to challenge the apparent despot. In early April, this new animal was tagged, along with eight others, and became known as "Red-tag." Red-tag and Tumor-tail engaged in games of bluff and threat, employing open mouths, inflated postures, and low growls – until one morning in April.

That day began like all the others of this period. Bellowing started around six in the morning and was interspersed with courtship until about seven. Then, there was calm. Sitting on the wooden walkway which bisects the lake, I had just finished reloading my movie camera. Suddenly the water began to boil and foam as two gators – each over ten feet in length and weighing about 500 pounds – slashed and grabbed for a vulnerable part of the opponent's anatomy.

Because of the froth, I was unable to identify the combatants at first. When the thrashing stopped, I saw that Red-tag had a death grip on one of Tumor-tail's hind limbs, while Tumor-tail had a bite on one of Red-tag's limbs. Whenever one of the combatants started to move, the other tightened his grip. They continued in this position for about an hour. Finally Tumor-tail gave up the grip, Red-tag released his hold, and the vanquished Tumor-tail swam off.

Red-tag was now dominant and therefore able to court more females than the subordinate males. But it is not known whether he also fertilized more females than did other males. It was obvious, however, that dominant males actively discouraged sub-dominant and submissive males from approaching or attempting to mate with available females.

As another result of dominance, Red-tag defended a large area of the lake against male intruders. But he



Leslie D. Garrick, NYZS

*Advertisement by an alligator may lead to an approach by a member of the opposite sex—and sometimes to courtship.*

did not defend it every moment of the day and night, and thus it can be considered a transient territory. It represents a familiar region where females might congregate and be courted.

Territorial defense and aggression were not entirely limited to males. The dominant female, known as "Orange-tag," was quite big: seven-and-one-half feet and 200 pounds. She defended a large territory in the lake that included the only entrance to a canal, along whose grassy bank she later built her nest and laid her eggs. Her aggressive tendencies were obvious from the way she excluded other females from the area. Many females suffered bites when they inadvertently entered her territory.

Several times I witnessed her favorite technique, which was to trap the intruder in a pocket along the shore, forcing her out of the water and onto land. As Orange-tag floated in the shallow water nearby, she remained vigilant, wagging her tail to and fro. In contrast to her response to females, she permitted some males to court her, and indeed led them up the canal to a secluded pool beneath the overhanging Spanish moss in the shade of the palms.

When nesting time approached, she discouraged mating attempts, and the intensity of her defense stiffened. Although other females were aggressive, none was obviously territorial nor displayed Orange-tag's foresight in defending an area near a future nest. The function of her territorial behavior became apparent only later.

As in commerce, so too in the social life of animals, the maxim holds: It pays to advertise. Unlike other animals which employ bright colors, prominent appendages, or vocalizations – usually by the male – for advertisement during courtship displays, male and female alligators appear to be identical, even to the trained observer. To advertise their presence and location, alligators employ two conspicuous displays: bellowing and headslapping (slapping their heads against the water's surface).

During the later part of April, I had to rise earlier and earlier to witness the first bellowing of the day. Almost always, a lone gator along the shoreline raised itself out of the water and sounded off. Before the vocalizer had finished, several others picked up the call and the chorus was on. Most assuredly the dominant males and females bellowed soon after the chorus commenced, and they bellowed often. Fortunately,

the marked animals and those I could recognize were as vocal as the others, and I was able to make some excellent tape recordings.

Later analysis of the recordings confirmed my observations that Red-tag, Orange-tag, Scarhead, Flesheye, and other known individuals have distinctive voices. That is, once a particular volume and pitch of the bellow was associated with an alligator, I was able to identify the individual by sound.

Although much of the bellowing appeared to be "spontaneous," as described above, at other times it was obviously triggered by headslaps or by bellow-growls (a shortened, throaty bellow made by females attempting to flee from an approaching male). Generally the entire group became animated during bellowing, with some gators swimming in every direction, stopping to bellow, and then moving on. However, the significance of this display is that some bellowers are approached by other alligators, and this is one way that both sexes may attract potential mates.

Headslapping is an unusual but very effective display. The animal assumes a posture as if to bellow, but maintains the head-up position for nearly half-a-minute. Then without the benefit of warning to the observer – such as some small movement – it opens its mouth while simultaneously driving its head toward the water's surface. The resulting sound is the combination of two things: the splash of the lower jaw hitting the water, and the "pop" produced when the upper and lower jaws meet as the head completes its downward movement. In some instances, a low growl follows the headslap; in others, an inflated threat-like posture may be assumed. As with bellowing, this display also communicates presence and location, and headslappers too are approached by other alligators whose intentions are occasionally aggressive and at other times amorous.

To visualize how the advertising system operates and how approaches are resolved, let us follow encounters of two previously mentioned gators: Orange-tag, a female, and Tumor-tail, a male. Tumor-tail has just finished bellowing or headslapping, and is immediately approached by an unmarked female who actively solicits him for courtship. But if he is approached by Red-tag, the dominant male, he is likely to be chased, threatened, and even forced to fight. However, if Orange-tag is advertising, and she is approached by a male, she has two options: She may emit a series of from one to six bellow-growls and then swim away, or she may be receptive to the male's advances and courtship will proceed. We rarely saw females approach other females after these displays.

The system thereby favors the accumulation of non-territorial females by the dominant males through the male advertisement, and it also enables the males, who are ready to mate, to locate females. It appears that alligators are polygamous, with the more dominant males, perhaps, contributing a greater proportion of their genes to the subsequent generations than subordinate males.

Observation and classification of these pre-copulatory behaviors required that Jeffrey Lang and I spend many consecutive hours on the walkway and in a small wooden blind in the high grass along the south shore of the lake. Fortunately, the gators did not flee when we watched, filmed, and recorded their love-play.

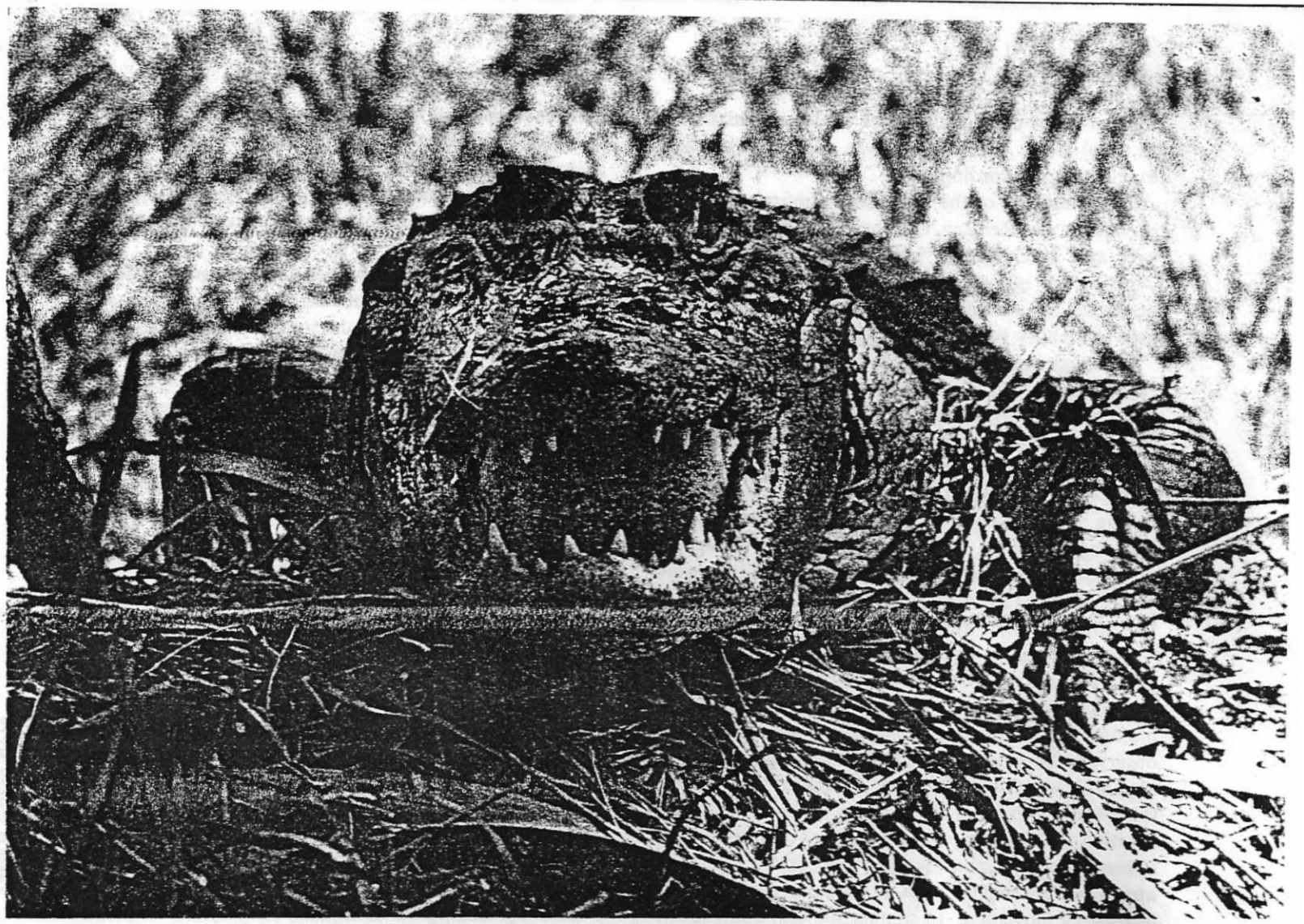
When all the requirements of early courtship are met – advertisement by the individual, approach by a member of the opposite sex, and receptivity of the female – the pair launches into a complex and varied sequence of auditory, tactile, visual, and possibly olfactory stimulation, lasting anywhere from minutes to hours. Hence, what might be expected to be a rather routine mating turns out to be quite an amorous and playful affair.

Again it might be easier to visualize this phase of courtship through the behavior of two known animals, Blue-tag, a male, and Toothy, a female. When Blue-tag bellowed, Toothy rapidly approached him. As she closed the distance between them, she cautiously stopped about two feet away. Ever so slowly, she inched her snout next to his. He turned his head and planted his snout just behind the prominent bulge of her jaw musculature.

Blue-tag attempted to mount Toothy after the snout-greeting but was unsuccessful. Circling about each other, they alternately submerged and surfaced. Both emitted a series of low cough-like sounds: "chumpf, chumpf, chumpf." It appears that these courtship whispers facilitate further contact and may help to identify the individual.

When Blue-tag and Toothy were more familiar with each other, they took turns riding around on each other's back. Following this phase, each proceeded to rub the undersides of the lower jaw on the other's head and snout in slow, methodical movements. While rubbing, Blue-tag's throat glands, which are normally not visible, popped out through a slit in the skin. This suggested the possibility that the nearness of head regions provided an opportunity for the supposed secretions of these glands to affect the partner. (Just what role these glands play in courtship has not been established, but they definitely are visible during pre-copulatory behavior.)

Periodically submerging, Blue-tag swam around Toothy and blew bubbles about her head and body. She would also do this to him. I have noticed this behavior with Cuban and American crocodiles, and it



*A female alligator hisses with open mouth, as part of the nest defense display. During the eighty days it takes for her eggs to hatch, she must guard the site constantly against potential predators.*

appears to be a subtle form of stimulation. On the other hand, geysering is not subtle. It is the dramatic exhalation of water through the nostrils, so that it rises in a spout about eight inches high. It might be performed during this part of courtship by either Toothy or Blue-tag; however, the geyser elicited no definite response.

In contrast to some published views which propose that males are the sexual aggressors, our observations suggest that many, if not all, of these behaviors are initiated and shared by both sexes. The typical, complete courtship sequence is rarely seen as described here. Rather, except for the initial greetings, the precopulatory behaviors by the mating pair are added-on and shifted about over several days. The likely functions of this relaxed but complex method are to synchronize arousal in the pair so that fertilization occurs at an appropriate physiological time, and to insure that, through an exchange of signals, breeding is restricted to members of this particular species.

Copulation, in contrast to the complex courtship behaviors, was difficult to detect, at least for this observer. What I looked for was a posture easily discernible above the water-line. However, I have only suspicions. What is suggested is an intertwining of their tails so that the female's cloacal vent is accessible to the male's organ; all I could see were the tails.

As the time for nesting approaches, the moderate temperatures of spring give way to the more constant heat and increased humidity of early summer – and the emergence of many mosquitoes. Changes take place in the alligator population too: There is much less interest in courtship; bellowing, headslaps, and aggression markedly decline. As the social behavior dwindled during the day, we spent more time following the females at night. This required us to climb over the wooden barrier on the walkway and enter the alligators' lair.

During one of these nocturnal observations, we noticed a female scraping together fallen palm fronds

and other plant debris, along with earth, in a crude heap. She was working beneath a tree alongside the canal. When completed in a few weeks, her nest would be above the high-water mark and, at least for some of the day, in the shade. We paused just long enough to take notes by moon-glow before moving on.

We repeated our nightly excursions, quietly sneaking along the banks of the canals so as not to disturb the alligators. At least one female selected a nest site and then later abandoned it to start afresh. Some females, we were told, utilize the same nest-site year after year, while some may try to lay their eggs in the nests of others.

Observations were also conducted from a blind opposite the area where Orange-tag began to nest. From there, we noted that nest construction involves both sets of limbs, working in concert and coordinated with packing, using the weight of the tail. Others have suggested that the female uproots vegetation with her mouth, but we cannot confirm this. Nest-shaping and landscaping are complex activities that persist for about a week prior to egg-laying. They culminate in the production of a three-foot high mound whose center contains a conical depression – the future egg chamber. Even then, alterations of the basic nest-shape continue within a few hours of laying.

On a warm night in mid-June just after midnight, as we brushed the mosquitoes from our eyes, we could see Orange-tag begin to lay her clutch at the rate of one egg every thirty to forty seconds. The entire process lasted only about forty-five minutes.

Immediately after the last egg was laid, she began to cover them with her hind feet, moving them alternately in a regular pattern. She worked almost continuously, interspersed with only occasional rest periods of one to two minutes. She moved around and over the nest, pushing nesting material back behind her. This activity lasted through the early morning hours, finally terminating about the time that the first rays of sunlight struck the nest. Certainly weary, she slid into the canal, and we slowly made our way back to the house for breakfast.

In about eighty days, the maternal aspect of her social life would commence. Until then she must guard her nest against potential predators, such as raccoons. It is during this period that female alligators of any size are most dangerous to humans.

Although man has just begun to study its behavior, the alligator has an ancient lineage. Crocodilian-like animals comprise a group of reptiles whose fossil record extends back nearly 200 million years. They evolved at the same time as the dinosaurs, but survived them. The fossil remains of the genus *Alligator* are dated at thirty-six million years in North America and Asia, and the likely ancestor of the American alligator lived twenty-five million years ago in Florida.

The present-day distribution of these large reptiles includes the southern states from South Carolina to Texas. Consequently, they now inhabit a temperate rather than a tropical climate where most crocodilians evolved and still live today. Survival in temperate regions required that the animal be able to escape climatic fluctuations that might prove injurious, such as extreme heat or sudden cold. Here may be a link between the survival traits and one of the known ecological roles of alligators.

Perhaps the chances for survival of these forms were enhanced by their ability to excavate shelters beneath the earth's surface and thus escape both the weather and predators. Indeed the alligator's role in the ecology of the Everglades of southern Florida is vividly demonstrated as being a result of its burrowing abilities. By digging into the muck of the sawgrass marsh, it creates moist caverns which serve as oases for many aquatic animals that would otherwise die on the parched earth-floor during the dry season. The concentrated animal life, which includes snails, fish, and turtles, is a food source for birds and mammals, such as herons and raccoons. And the alligator, because it is an opportunistic feeder, can prey on any of them. Thus it shapes the intricate community in the Everglades and insures survival for those water-dependent forms by its ability to provide refuge during dry periods.

Despite protection by federal and local laws, it remains questionable whether the American alligator will survive. This has more to do with the destruction of its habitat than with killing the animal for its hide, and its plight is compounded by the lack of systematic field studies. Obviously, it is difficult to know what aspects of alligator life history are being altered when, in fact ,we are just beginning to study its behavior and ecology. Although the alligator's role in the ecology of the Everglades is appreciated, the species also lives in a variety of aquatic habitats where it has not been studied. Because human intervention tends to destroy or disrupt these habitats, the immediate task is to study the American alligator as it lives – in marsh, swamp, pond, river, lake, borrow-pit, and roadside ditch. □

---

Dr. Leslie Garrick is a research fellow with the New York Zoological Society's Center for Field Biology and Conservation. His most recent study is an analysis of crocodilian vocalizations. The field research on American alligators was conducted with Jeffrey W. Lang, a doctoral candidate at the University of Minnesota, who is studying the activity rhythms and the regulation of body temperature of crocodilians.