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FORAGING IVORY-BILLED WOODPECKERS IN THE SINGER TRACT IN LOUISIANA: MATCHING JAMES T. TANNER'S FIELD NOTES WITH HIS PHOTOGRAPHS FROM 1939

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ABSTRACT

Few photographs exist of living Ivory-billed Woodpeckers (*Campephilus principalis*), and no previously known photographs show the species foraging. We found a reference in James T. Tanner's field notes to several photographs taken on 23 April 1939 of a group of Ivory-billed Woodpeckers foraging in a recently dead pecan tree (*Carya illinoensis*). We also found a series of four archived photographs taken by Tanner that shows the same upper branches of a recently dead pecan. We found at least one definitive and probably up to three Ivory-billed Woodpeckers in the photographs, indicating these were the intended subjects. Approximately 30% of the bark is removed from a perch branch between the first and last images in the sequence, consistent with known foraging behavior of Ivory-billed Woodpeckers. The photographs illustrate aspects of Ivory-billed Woodpecker foraging behavior described in the literature and show individuals in the group spaced at distances of <1 m. These are among the last known photographs from the Singer Tract population.

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INTRODUCTION

The Ivory-billed Woodpecker (*Campephilus principalis*) is a critically endangered (if not extinct) species that originally occurred throughout most of the southeastern U.S. and on Cuba. Photographs of Ivory-billed Woodpeckers are scarce and are of high importance, both as documentation and as references for the bird's appearance and ecology that can be used in field searches for individuals that may be extant. The largest number and best quality photographs of Ivory-billed Woodpeckers are from the years 1935–1939 when Arthur A. Allen and James T. Tanner photographed nesting pairs from tree blinds as well as a nestling during banding (Allen and Kellogg 1937, Tanner 1942). These photographs were taken in Northeast Louisiana's Singer Tract, an approximately 32,400 ha parcel at the time composed of old- and second-growth bottomland hardwood forest in the Mississippi alluvial floodplain, much of which now is second-growth included within Tensas River National Wildlife Refuge and Big Lake Wildlife Management Area.

The Singer Tract tree-blind and nestling series is preceded by three poor-quality photographs from Florida taken by Allen during 1924: (1) a heavily retouched image of a displaying pair (reproduced in Jackson 2004), (2) a similarly retouched, unpublished lantern-slide image of a male that is housed in Cornell University Library's Rare and Manuscript Collection, and (3) a distant image reportedly of an Ivory-billed Woodpecker (but unrecognizable as that species) perched on the trunk of a pine tree (Allen and Kellogg 1937). Three sets of photographs exist from Cuba: (1) three photographs taken in 1941 with one of an Ivory-billed Woodpecker at a cavity tree and two of a captive individual (Gallagher 2007, Estrada 2014), (2) a photograph taken in 1948 of a bird at an active nest cavity (Dennis 1948), and (3) a photograph taken in 1956 of a bird distantly perched in a live pine tree (Gallagher 2007). None of the seven known image sets shows a foraging Ivory-billed Woodpecker. Photographs of feeding trees, reportedly the work of Ivory-billed Woodpeckers, are presented in Allen and Kellogg (1937) and Tanner (1942) but it is unclear whether the foraging markings were presumed or confirmed to be of that species, limiting the usefulness of these photographs for deriving diagnostic features of Ivory-billed Woodpecker foraging sign.

We found reference in Tanner's unpublished field notes to his taking a "few pictures" while he was observing a family of four Ivory-billed Woodpeckers actively foraging in a recently dead pecan tree (*Carya illinoensis*) on 23 April 1939. Furthermore, in a series of four archived photographs taken by Tanner and dated April 1939, we discovered woodpeckers in each of the photographs with plumage patterns and shapes indicating these were the Ivory-billed Woodpeckers Tanner mentioned as foraging on this same tree as described in his notes. One of the Ivory-billed Woodpeckers in the photographs appears to be scaling bark from a dead branch, a behavior that matches the known foraging behavior of the species.

Considering the potential biological and historical importance of a newly discovered series of images showing any Ivory-billed Woodpeckers, but especially some in the act of foraging, we present the unpublished field notes and cropped-in versions of the photographs from April 1939. Our objectives are, first, to examine the field notes, images, and photo-captions for matches and contradictions to determine whether this is the series of photographs showing foraging Ivory-billed Woodpeckers that Tanner mentioned, and

second, to examine the photographs for any biological information they may contain, in particular, on the foraging sign made by Ivory-billed Woodpeckers, and on inter-individual spacing in groups during foraging.

METHODS

The photographs we examined are in a collection of 106 images by Tanner from the Singer Tract, taken between 1935 and 1941, inclusive, and archived in the Louisiana Digital Library as the Tensas River National Wildlife Refuge / U.S. Fish and Wildlife Service/ Ivory-billed Woodpecker Records (Mss. 4171), Louisiana State University Libraries, Baton Rouge, LA, USA. The photographs are available online at <https://louisianadigitallibrary.org/islandora/object/lsu-sc-tensas%3Acollection> (2 February 2021).

While looking for images of foraging markings of Ivory-billed Woodpeckers in the Louisiana Digital Library collection, we noted objects with the shape and color pattern of Ivory-billed Woodpeckers in four photographs, 4171072p through 4171075p. On the website, these photographs are numbered 86 through 89 and appear in a different order: 4140173p, 4171074p, 4171075p, and 4171072p. We inferred the long archival numbers represent the order in which the images were taken because they are congruent with the progressive removal of bark from the branch. Since the photo-captions indicate that the photographs were taken by Tanner in April 1939, we re-read his field notes from that month, archived in James Taylor Tanner papers, collection no. 2665, Division of Rare and Manuscript Collections, Cornell University Library, Ithaca, NY, USA. The only mention in the notes related to photographing a situation identical to that in the images in the Louisiana State University collection was dated 23 April 1939.

We cropped the photographs using the crop tool in Photoshop CS3 (Adobe) to an area where bark scaling occurs and where the woodpeckers are perched on branches at positions varying between the frames. Using the pencil tool in Photoshop CS3 we delineated an unequivocal Ivory-billed Woodpecker in red and other likely Ivory-billed Woodpeckers in purple.

RESULTS

Tanner's field notes from 23 April 1939 are typed and are somewhat faint but can still be read (Figure 1). The entry includes the following statement:

“...and then we found all four birds, Ma and Pa, Sonny Boy, and Baby Bunting, togeh (*sic.*) in one tree. They began to travel south, and in one or two flights, reached a big recently dead pecan just as the sun hit the tops of the trees. They fed there for some time, both parents feeding the young bird. At one time there were two Pileateds in the same tree with the four Ivory-bills. I took a few pictures. They continued on south from there...”

In all of Tanner's subsequent writings and publications he never identified any photographs as being the ones that he mentioned in his 23 April 1939 field notes.

4/23 - Sun. Jesse and I left camp about 4:00 and walked up to the roost holes, sitting down under the old ash roost. About 5:15 the male slipped quietly out of his hole, flew to the near stub, called a bit from there. He soon flew east and in two flights apparently joined the female. They made a few short flights and then we found all four birds, Max and Pa, Sonny Boy, and Baby Bunting, together in one tree. They began to travel south, and in one or two flights, reached a big recently dead pecan just as the sun hit the tops of the trees. They fed there for some time, both parents feeding the young bird. At one time there were two Pileateds in the same tree with the four Ivory-bills. I took a few pictures. They continued on south from there in fairly long flights, stopping to feed on dead or dead-topped trees. About 8 o'clock they crossed Sharkey Road a little west of L. Carter's, seemed to go on down the slough. Jesse and I walked on out the road and ~~xxx~~ came to town.

The young bird is growing rapidly and flies strongly. His crest has lengthened from his head, is still blunt; tail is getting pointed; eye in certain lights ~~xxxx~~ appears light. His voice is almost like the adults, but still a little weak, and he gives the same food call when approached by parents. He pecks some himself now.

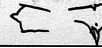


Figure 1. James T. Tanner's typed field notes from the Singer Tract, Louisiana, 23 April 1939, describing the observation and photography of a family group of four Ivory-billed Woodpeckers foraging in a dead pecan. Reproduced from field notes archived in the James Taylor Tanner papers, collection no. 2665, Division of Rare and Manuscript Collections, Cornell University Library.

The four archived photographs 4171072p through 4171075p taken by Tanner that we examined are all titled "Sweet pecan with ivory-billed woodpecker feeding sign, April 1939." These photographs depict the same scene in a series, the top of a tall dead tree seen through an opening in the foliage of lower trees (Figure 2). The tree is recently dead, based on the



Figure 2. Photo 4171072p, the first of a series of four photographs by James T. Tanner archived in the Louisiana Digital Library and labeled "Sweet pecan with ivory-billed woodpecker feeding sign, April 1939". The four photographs show the same tree-top under the same angle and lighting conditions. The full frame is reproduced here; in Figure 3, details are shown from the branch fork to the right of the center of the frame.

lack of foliage and small twigs still remaining. The dead tree is illuminated by sunlight from a low angle, which is consistent with Tanner's field notes about the pecan with the Ivory-billed Woodpecker family group.

When cropped into the center fork and enlarged, the sequence of photographs shows woodpeckers appearing and disappearing at various positions on the branches (Figure 3). In the first three photographs (4171072p - 4171074p), a woodpecker is perched with an elongated, vertical posture, and in the first two photographs (4171072p and 4171073p) its folded wings show the diagnostic triangular white shield of an Ivory-billed Woodpecker. In 4171074p the presence of a dorsal white wing shield is ambiguous, probably because the bird is perched on the shadow side of the branch. In image 4171073p, there is a white stripe above the white shield, consistent with the shoulder stripes of the Ivory-billed Woodpecker. The final frame (4171075p) shows a bird jumping from the top of the left branch and beginning to open its wings. This image does not show a white leading edge in the under wings which is consistent with another photograph of Ivory-billed Woodpecker in flight under backlit conditions (Plate 13 in Allen and Kellogg 1937). It does show a white trailing edge in the opening wings, which is consistent with the Ivory-billed Woodpecker. In 4171073p two additional woodpeckers with indistinct shapes and postures are discernable on the right branch of the fork, with white patches on their folded wings. In 4171074p an

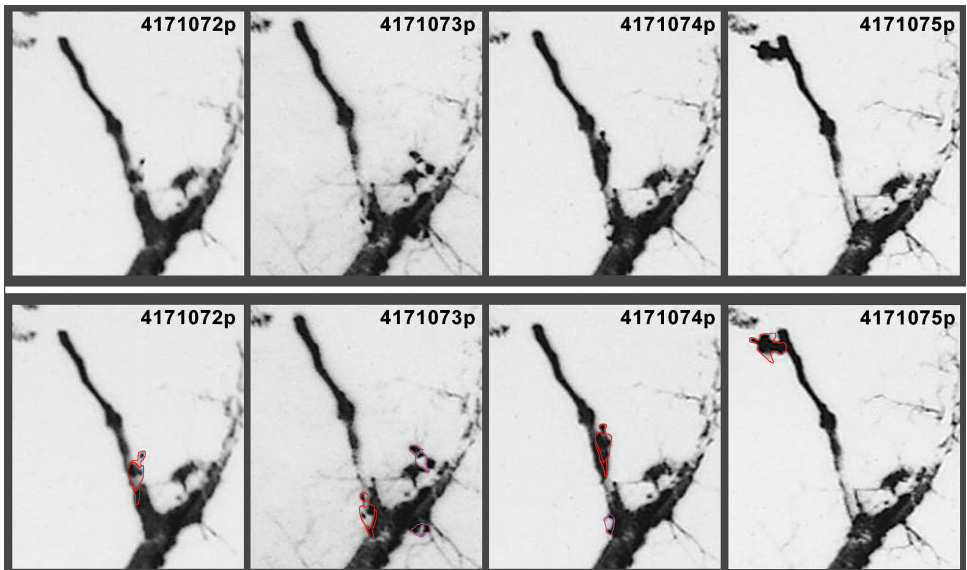


Figure 3. Top row: details from photographs 4171072p through 4171075p, showing a branch fork with at least one Ivory-billed Woodpecker and several black-and-white objects appearing and disappearing at various positions indicating additional woodpeckers with some characteristics consistent with Ivory-billed Woodpeckers. Bottom row: the same row of photo-details, now with outlined in red objects that match the shape and color pattern of Ivory-billed Woodpecker, and outlined in purple are the several black-and-white objects that appear in two images but not in other photographs of this scene. Note that between the first and last photograph bark is removed at the lower part of the left branch.

indistinct white triangle is visible at the base of the left branch at the same position where a more distinct woodpecker shape is apparent in the previous image.

In the first photograph in the series, 4171072p, the left branch appears mostly if not completely covered in dark bark. Bark has been removed in the next two photographs at the lower part of the branch, and in the last image ca. 30% of the branch length shows exposed wood (Figure 3). The branch from which bark is scaled has no twigs or small side branches remaining and so appears to be further along in the decay process compared to the right branch of the fork that has a few side branches and small twigs remaining.

Based on elongated woodpecker shape of the Ivory-billed Woodpecker in photograph 4171074p, and using its wing chord length for scale, we measured a diameter of 8 cm for the foraging branch. Using the same scale, and the transitory shapes with features consistent with other Ivory-billed Woodpeckers photographed in Figure 3 (indicated by purple outlining), we measured distances of 66, 49, 68, and 62 cm between the perch positions of the birds in the viewing plane of photographs. Allowing for slightly larger actual distances because the right branch is angling away from the viewing point, we estimated inter-individual perch distances to be less than 1 m.

DISCUSSION

The scene in the four archived photographs matches the scene described in Tanner's 23 April 1939 field notes, which mention his photography while observing a family of four foraging Ivory-billed Woodpeckers, made up of a breeding pair, a one-year-old male offspring from the previous year, and a recently fledged juvenile. Specifically, the photographs show a tall, recently dead tree that is illuminated by sunlight from a low angle, and the field notes describe the woodpeckers foraging in a big, recently dead pecan just as the sun hit the tops of the trees in the early morning. Tanner (1942:104) specified the scientific name *Carya pecan* for sweet pecan, a synonym for the currently accepted *Carya illinoensis*. Sweet pecan and pecan are both common names for *C. illinoensis*, with the latter now more widely accepted. Thus, the tree species in the captions, sweet pecan, matches that in the notes, pecan, and the year and month in the captions match the observation date. There are only three occasions that Tanner observed Ivory-billed Woodpeckers feeding on sweet pecans or bitter pecans (*Carya aquatica*, also commonly known as water hickory) (Tanner 1942:42). Tanner's notes indicated the other two were from 1938, on 25 March (involving scaling bark) and on 28 April (involving digging) and both involved a young male woodpecker in home ranges other than John's Bayou (a bird Tanner had named "Mack's Bayou Pete"), so neither the dates nor the location matches the photo captions. The existence of four photographs of the same scene matches Tanner's reference to "a few pictures" in the notes.

The changing positions of several objects in the photographs and the flight launch in the last of the series demonstrate that these objects are birds. The vertical perch positions indicate the objects are woodpeckers. The white triangular wing shields and white wing stripes are diagnostic for Ivory-billed Woodpecker, and the removal of bark by scaling is consistent with the dominant foraging behavior of the species (Tanner 1942:42). For these reasons, we conclude that the photographs show the group of foraging Ivory-billed Woodpeckers that Tanner reported to have observed and photographed on 23 April 1939. Importantly,

this sequence of photographs documents for the first time Ivory-billed Woodpeckers in the process of foraging through the removal of bark by scaling that is consistent with the dominant foraging behavior of the species, at least during the breeding season on the Singer Tract (Tanner 1942).

It appears that the archived photo-captions “Sweet pecan with ivory-billed woodpecker feeding sign, April 1939” are from Tanner, as there is no other way that the tree species, month, and year could have been specified. It seems odd, then, that Tanner did not mention the appearance of Ivory-billed Woodpeckers in these photographs. The archived images were made from negatives donated by Tanner in 1988 (Judy Bolton Louisiana State University pers. comm.) or 1990 (N. Tanner pers. comm.). It is possible the captions were written only then, decades after the photographs were taken; this may have introduced discrepancies. It is noteworthy that in his collection of 106 photographs from the Singer Tract archived at Louisiana State University, Tanner typically made or selected only one print or negative of any landscape scene or foraging tree, or at most two, but from different angles. The sweet pecan sequence is the only series in the entire collection that shows multiple successive photographs of one and the same scene. This suggests that Tanner was attempting to capture a non-static subject of high interest. We find it possible, but unlikely, that Tanner had forgotten about the presence of the Ivory-billed Woodpeckers in these photographs with the passage of time, given the uniqueness of what he witnessed. An alternative explanation is that he thought it unworthy of mention that there were Ivory-billed Woodpeckers in the photographs, given the tiny size of the birds and the distance involved.

In his field notes Tanner mentioned that in addition to four Ivory-billed Woodpeckers, two Pileated Woodpeckers (*Dryocopus pileatus*) were in the same tree at one point (Figure 1). In Tanner (1942:54) it is further specified that the Pileated Woodpeckers were in the same tree as the Ivory-billed Woodpeckers “for almost half an hour without paying any obvious attention to each other”. Tanner did not specify in his notes whether or not he took the photographs while the Pileated Woodpeckers were present. Regardless, we can rule out Pileated Woodpecker as the identity of the woodpeckers in the images based on the presence of white wing shields, and we were unable to find Pileated Woodpeckers elsewhere in the photographs. In addition, Tanner (1942:44) recorded four foraging observations of Pileated Woodpeckers in pecans, and they all involved digging, so there is no indication that Tanner had observed a Pileated Woodpecker scaling bark on the sweet pecan during the 23 April 1939 event.

The feeding behavior documented in this series is largely but not completely typical for Ivory-billed Woodpecker foraging ecology as described by Tanner (1942). According to Tanner (1942:41), Ivory-billed Woodpeckers in Louisiana usually foraged high in the tops of recently dead or dying trees, and 70% of Tanner’s feeding observations involved scaling bark (Tanner 1942:42), as is the case in this series of photographs. The photographs are atypical in that foraging on sweet pecan and bitter pecan was only rarely observed by Tanner – in 3% of observations – a frequency that matched the availability of these tree species in the environment. Sweet gums (*Liquidambar styraciflua*) and Nuttall oaks (*Quercus texana*) were generally preferred for foraging (Tanner 1942:42). Tanner summarized his findings by stating that, at least during the nesting season, Ivory-billed Woodpeckers mostly foraged

“under the bark of dead limbs,” and only shared foraging space with Pileated Woodpeckers on “stumps” that were still “hard but partly punky” (Tanner 1942:51). The third foraging situation found by Tanner, punky and rotten tree trunks, logs, and dead limbs, were fed upon only by Pileated Woodpeckers, never by Ivory-billed Woodpeckers (Tanner 1942:51). The beetles found in the trunk of a dead hackberry (*Celtis* sp.), where Ivory-billed Woodpeckers fed far less frequently during the breeding season, have longer life cycles with considerably larger larvae primarily found in boles (Tanner 1942:43, Evans 2014). Whether or not post-breeding Ivory-billed Woodpeckers shift more into Pileated Woodpecker foraging space by digging into more fully punky to thoroughly rotted wood is unknown, but certainly Ivory-billed Woodpeckers have physical characteristics that would enable them to do so (Tanner 1942:44). Stomach samples taken from Ivory-billed Woodpecker specimens that were collected in late summer and in autumn indicated a more varied diet than what Tanner observed earlier in the season, with larger beetle larvae making up an important proportion of animal parts detected during the post-breeding period (Tanner 1942:40).

Tanner (1942:40, 74-76) noted that smaller beetle larvae were carried to the nest by adults to feed the unfledged young more frequently than were larger larvae. Tanner (1942:40-41) did also find hard parts of large beetle larvae in the nest debris, but he attributed this to their being more persistent than small larvae hard parts, which he surmised had been carried out with the fecal material by the adults. Tanner (1942:41) stated that wood-boring beetle larvae were “unquestionably the most important food of the Ivory-bill”. There is some evidence (Haack 2017:110) that the smaller diameter high branches, when freshly dead, were mostly populated with small (<25mm) larvae, whereas the longer dead larger branches and dead stumps were populated with larger larvae. Therefore, works by authors (e.g., Jackson 2002, 2004; Snyder et al. 2009; U.S. Fish and Wildlife Service 2010) that state or imply that the loss of large beetle larvae from old forests was considered by Tanner (1942:52-53) to be largely responsible for the demise of the Ivory-billed Woodpecker, should be re-examined. In contrast, we interpret that Tanner’s hypothesis that food was limiting included that the loss of smaller larvae especially, under the bark of primarily small high branches recently dead, as shown in this series of photographs, was a major factor in the demise of the Ivory-billed Woodpecker. This clarification on Tanner’s observations should be investigated further. As the photo series provides visual documentation of a characteristic foraging substrate and characteristic scaling sign of the Ivory-billed Woodpecker and is the only such series where the photographed substrate and sign is unequivocally made by Ivory-billed Woodpecker, this photo series is of high importance in searches for persisting individuals of this species. It provides a visual search image that augments written descriptions of Ivory-billed Woodpecker foraging sign.

Tanner (1942:21), in his searches for populations of Ivory-billed Woodpeckers, used the occurrence of bark patches that had been scaled from recently dead tree trunks and branches as foraging sign indicative of Ivory-billed Woodpeckers. Tanner concluded that the species was likely present based on such foraging sign along the Apalachicola River in Florida without further corroborating evidence besides local reports. With regard to reported differences between Ivory-billed Woodpecker and Pileated Woodpecker foraging sign, Tanner (1942:21) indicated that scaling by Pileated Woodpeckers is usually confined

to smaller branches and those longer dead. In recent searches for Ivory-billed Woodpeckers, following the descriptions of foraging sign from Tanner (1942), scaled bark from recently dead trees and branches was used as a clue for the possible presence of the species (Jackson 2004, Rohrbaugh et al. 2006, Hill 2007).

While the scaling of tight bark from tree trunks has now also been documented to have been performed by Pileated Woodpeckers to at least a limited extent (Rohrbaugh et al. 2007), this alone is not a contradiction to what Tanner (1942:21) described as he emphasized the presence of “extensive” foraging sign, especially in high limbs. Tanner also frequently relied on abundance of sign in conjunction with the presence of roost or nest holes, as an indicator of residence (1942:20-29). Tanner based this on his own observations as well as those of other observers familiar with the species, especially correspondence from H. Stoddard (Stoddard 1969). Tanner was more skeptical of relatively isolated or scattered potential foraging sign (again following Stoddard’s advice). In such situations, i.e., where he found a small amount of potential sign, Tanner (1942:26-27) would suggest that, at best, this might have been from Ivory-billed Woodpeckers passing through an area (as Tanner believed was the case for Ivory-billed Woodpeckers reliably being reported along the Santee River in South Carolina during the mid-1930s), as opposed to a permanently occupied territory.

We recognize alternative explanations for the outlined shapes in purple (Figure 3) that match typical woodpecker postures or plumage patterns. For example, the purple shape in photograph 4171074p is consistent with the white shield of the vertically perched Ivory-billed Woodpecker that we found in the previous photograph, but the upper body and head are not evident in this photograph. An alternative explanation is that this shape could be a dislodged bark flake that goes missing again in the next and last photograph. Nevertheless, it stands to reason that Tanner took photographs while a group of Ivory-billed Woodpeckers were in view, rather than one, and reported the group stayed visible on the bare branches of the tree for an extended period (Tanner 1942:54). If the less distinctive objects in the photographs 4171073p and 4171074p are indeed Ivory-billed Woodpeckers, the individuals were in fairly close proximity to each other, less than 1 m apart. Tanner reported family groups traveled together and often foraged together in the same tree, but he did not comment on the distances maintained between foraging individuals. Other large woodpeckers such as Magellanic Woodpeckers (*Campephilus magellanicus*) and Great Slaty Woodpeckers (*Mulleripicus pulverulentus*) often forage in groups and individuals are frequently observed feeding together at distances of less than 1 m (Chazarreta and Ojeda 2011, Lammertink 2004). The Tanner series of photographs discussed herein suggests that such short inter-individual distances also occurred in Ivory-billed Woodpecker groups while foraging.

In addition to providing the only photographic documentation of foraging Ivory-billed Woodpeckers, the pecan series is significant as being among the last photographs from the last universally accepted population of Ivory-billed Woodpeckers in continental North America. The spring of 1939 was Tanner’s final full field season in the Singer Tract. On 7 April 1939 Tanner photographed adult Ivory-billed Woodpeckers at John’s Bayou on Dufaycolor film while they were feeding a large nestling in a Nuttall oak cavity (Bales

2010:204 and Tanner's notes). One color photo of this 1939 series, showing the diagnostic Nuttall's oak bark of the nest tree, is reproduced in Jackson (2004, Plate 10), though it is erroneously dated in the caption of the plate as March 7, 1938, a date on which Tanner also took Dufaycolor photos of nesting Ivory-billed Woodpeckers, but of a nest in a red maple (*Acer rubrum*) (Bales 2010: 139 and 145). On unspecified dates in April 1939 Tanner took two photographs of Ivory-billed Woodpeckers in flight: one labeled as a juvenile and one labeled as an adult, archived as photos 4171079p and 4171080p in the Louisiana Digital Library. The poor quality of the flight photos, and of the foraging series we discussed here, illustrate the difficulty in obtaining good photo documentation of Ivory-billed Woodpeckers away from occupied cavities. Tanner's 1939 color photos taken at the nest, the flight photographs, and this series of foraging Ivory-billed Woodpeckers are the last known photographs that document the Singer Tract population of this species.

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Editor’s Note: While this study does not include work carried out in Tennessee, it does involve a species that likely occurred in west Tennessee and is based on the work done by long-time Tennessee resident Dr. James T. Tanner (1914-1991). Tanner, through his doctoral studies at Cornell University, became the world’s foremost expert on the Ivory-billed Woodpecker. After a stint in the U.S. Navy during World War II and two years teaching at East Tennessee State University, Tanner spent the rest of his productive career on the biology faculty of the University of Tennessee at Knoxville conducting research on community ecology, teaching hundreds of students in these fields. He was a member and president of the Tennessee Ornithological Society and served as editor of *The Migrant* for many years. He died in 1991 and is buried in Knoxville, having adopted Tennessee as his home state for most of his life. - Bob Ford