

# PIÑON PINES AND THE ROUTE OF CABEZA DE VACA

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The *Relación* of Álvaro Núñez Cabeza de Vaca recounts the adventures of the Spanish explorer and his three companions in Texas and northern Mexico between 1528 and 1536. This narrative and a second document, commonly known as the Joint Report, are considered the earliest written accounts of travel through that region and together have been described as "the first contribution to Texan history."<sup>1</sup> Although many clues can be found in these works, the precise path taken by the Spaniards has been a subject of controversy for more than a century. The purpose of this paper is to focus on a region of piñon pines described in the narratives and to show how new botanical evidence, derived in part from recent field work, can be used to support one of the theories about Cabeza de Vaca's route.

In a 1987 historiographical survey, Donald E. Chipman described the route interpretations of more than two dozen modern historians and gave a critical analysis of how these routes had been constructed using the biologic, ethnographic, geologic, and physiographic data contained in the original narratives.<sup>2</sup> The majority of these authors favored trans-Texas routes that begin on the coast near Galveston, head inland through central Texas, and do not leave the Lone Star State until reaching the border at various points in distant west Texas. The accompanying map shows one such trans-Texas route, published in 1940 in a book-length study by Cleve Hallenbeck.<sup>3</sup>

However, a two-part study published in 1918 and 1919 by Harbert Davenport and Joseph K. Wells proposed a more southerly route, with the explorers leaving the Galveston region but then

traveling parallel to the Gulf coast before crossing the lower Rio Grande and spending considerable time in the states of Nuevo León, Coahuila, and Chihuahua in northern Mexico.<sup>4</sup> Building on this foundation, the 1955 doctoral dissertation of Alex D. Krieger developed an even more detailed case for a southern route, shown in the accompanying map.<sup>5</sup>

All route interpretations must explain the following passage from the *Relación* of Cabeza de Vaca, which recounts how the travelers reached the piñon region:

And with this we departed on the following day and crossed a mountain of seven leagues, and the stones of it were scoria of iron. At nightfall we arrived at many houses that were located on the bank of a very beautiful river. And the owners of them came out halfway to welcome us, with their children on their backs . . . .

They ate the fruit of prickly pears and nuts from pine trees. In that land there are small pine trees and the cones of these are like small eggs, but the pine nuts are better than those of Castile, because they have very thin shells. When they are green they grind them and make balls of them and eat them in that way; and if they are dry they grind them up, together with the shells, and eat them in the form of powder.<sup>6</sup>

The Joint Report also notes the distinguishing characteristic that the shells of these piñones were so thin the nuts could be eaten, shells and all:

In those huts which they reached were many well disposed people, and they gave them there great quantities of piñon nuts so good as to be better than those of Castile, because they have a shell of a kind that they eat it with the rest. The pine cones of these are very small, and the trees are full of them, through those mountains, in quantities.<sup>7</sup>

Many authors have attempted to answer two obvious questions: Which species of piñon best matches the description given by Cabeza de Vaca? Where can stands of these trees be found? So far as the present authors are aware, previous studies of Cabeza de Vaca's route have considered only two species: the New Mexico piñon (*Pinus edulis*) and the Mexican piñon (*Pinus cembroides*). The characteristics of these two species, compiled in Tables 1 and 2, are taken from modern botanical references.

**TABLE 1 CHARACTERISTICS OF THE NEW MEXICO PIÑON**

<b>SCIENTIFIC NAME</b>	<i>Pinus edulis</i>
<b>COMMON NAMES</b>	New Mexico piñon, Colorado piñon, Rocky Mountain piñon
<b>HEIGHT</b>	20 feet to 50 feet tall, most often about 35 feet tall
<b>HABITAT</b>	found at high altitudes, from about 5000 feet to 8000 feet above sea level
<b>RANGE</b>	New Mexico, Colorado, Utah, and northern Arizona; found in Texas only in the Guadalupe Mountains near the border with New Mexico
<b>CONES</b>	1 1/4 inches to 2 1/4 inches long
<b>THICKNESS OF SHELLS</b>	0.012 inch to 0.016 inch (0.3 mm to 0.4 mm) thick "moderately thin seed coat" (Perry) "moderately thick-shelled" (Bailey and Hawksworth)

**SOURCES:**

Jesse P. Perry, *The Pines of Mexico and Central America* (Portland, Oregon: Timber Press, 1991), 60; Dana K. Bailey and Frank G. Hawksworth, "Pinaceae of the Chihuahuan Desert Region," *Phytologia*, LIII (April, 1983), 229.



**TABLE 2 CHARACTERISTICS OF THE MEXICAN PIÑON**

<b>SCIENTIFIC NAME</b>	<i>Pinus cembroides</i>
<b>COMMON NAME</b>	Mexican piñon
<b>HEIGHT</b>	20 feet to 35 feet tall, occasionally reaching 50 feet tall
<b>HABITAT</b>	found at high altitudes, from about 5000 feet to 9000 feet above sea level
<b>RANGE</b>	widespread in Mexico, on both the Sierra Madre Occidental and the Sierra Madre Oriental; found in Texas in Jeff Davis County, Presidio County, and Brewster County, including stands in Big Bend National Park
<b>CONES</b>	1 inch to 1 1/2 inches long
<b>THICKNESS OF SHELLS</b>	0.020 inch to 0.040 inch (0.5 mm to 1.0 mm) thick "thick hard seed coat" (Perry) "probably have the thickest-shelled nuts of all pinyons" (Simpson) "very thick-shelled nuts" and "thick, rockhard shell" (Lanner) "seeds are hard-shelled thus not easy to eat" (Powell)

**SOURCES:** Jesse P. Perry, *The Pines of Mexico and Central America* (Portland, Oregon: Timber Press, 1991), 65; Benny J. Simpson, *A Field Guide to Texas Trees* (Houston: Gulf Publishing Company, 1988), 222; Ronald M. Lanner, *The Piñon Pine, A Natural and Cultural History* (Reno: University of Nevada Press, 1981), 6, 113; A. Michael Powell, *Trees & Shrubs of Trans-Pecos Texas* (Big Bend National Park: Big Bend Natural History Association, 1988), 51.

Cabeza de Vaca stated that the pine nuts were remarkable because they had "very thin shells."<sup>8</sup> This characteristic appears to rule out the Mexican piñon (*Pinus cembroides*), because botanical authorities agree that it has the thickest shells of all known piñons. Many authors over the last century have deduced that Cabeza de Vaca must have been describing the New Mexico piñon (*Pinus edulis*), even though its shells can be considered thin only by default, and have used this deduction to help support their trans-Texas route theories.<sup>9</sup>

Examples include Brownie Ponton and Bates H. McFarland, who stated in 1898 "that there can scarcely exist a doubt the piñon of Cabeza is the *pinus edulis* of New Mexico and Western Texas."<sup>10</sup> The 1905 translation of the *Relación* by Fanny Bandelier also identified the species as "*Pinus edulis*, the well-known Piñon tree with its edible nuts."<sup>11</sup> Similarly, Frederick W. Hodge's edition in 1907 included the footnote: "Doubtless the nut pine (*Pinus edulis*)."<sup>12</sup>

After consulting various authorities regarding the characteristics and distribution of both *Pinus edulis* and *Pinus cembroides*, Cleve Hallenbeck in 1940 likewise concluded that the "pine nuts mentioned by Núñez are, of course, the fruit of the piñon pine, *Pinus edulis*." In fact, Hallenbeck went so far as to say that "without the shadow of a doubt it was *P. edulis* that he found, and described." Hallenbeck believed that the travelers must have followed a trans-Texas route and then encountered *Pinus edulis* in the Sacramento Mountains of New Mexico.<sup>13</sup> Haniel Long, in a 1941 volume titled *Piñon Country*, agreed with Hallenbeck that Cabeza de Vaca found *Pinus edulis*, noting that "Núñez gives us our first description of the little tree."<sup>14</sup> In his 1961 translation of the *Relación*, Cyclone Covey also concluded that the text described *Pinus edulis* found in the Sacramento range of New Mexico. Covey derived much of his explanatory material from Hallenbeck's book, because he judged that Hallenbeck's research on Cabeza de Vaca's route "incorporates and supersedes all previous scholarship on the subject."<sup>15</sup>

Equally strong support for the Hallenbeck route came in 1981 from Ronald M. Lanner, whose book on piñon pines included the following evaluation:

A scholarly and exhaustive study has been made by Cleve Hallenbeck, who for many reasons, including geographic details of pine distribution, makes a convincing case for a route from west Texas through New Mexico and southeastern Arizona, rather than one extending deeply southwards into Chihuahua and Sonora. Also, Cabeza de Vaca's description makes it clear he was referring to *edulis*, not the thick-shelled Mexican piñon. While *edulis* shells are easily cracked with the teeth, those of Mexican piñon require judicious use of hammer or pliers. This bolsters Hallenbeck's case because a route traversing Chihuahua would encounter the thick-shelled piñon only.<sup>16</sup>

Hallenbeck's analysis remains influential to the present day. For example, in 1987 Stewart L. Udall reported that he "was swayed by Cleve Hallenbeck's conclusions" and agreed that "piñon nuts added a delicacy to their diets" as the four explorers traveled through the Sacramento Mountains of New Mexico.<sup>17</sup> In a 1993 translation, Enrique Pupo-Walker and Frances M. López-Morillas illustrated the journey with a map of the Hallenbeck trans-Texas route.<sup>18</sup> Statements locating the piñon region in New Mexico can be found in another translation from 1993 by Martin A. Favata and José B. Fernández, who announced that they "follow the majority of scholars in utilizing Hallenbeck most frequently as a source with regard to Cabeza de Vaca's route."<sup>19</sup>

However, in his historiographical survey Chipman seriously questioned such a strong reliance on Hallenbeck's northern route interpretation. After reviewing all the route theories, he reserved his strongest criticism for Hallenbeck's work and warned that "those who persist in

advocating a totally trans-Texas route for the first leg of the overland journey should reassess the soundness of scholarship on which it rests." Chipman did not explicitly discuss the piñon evidence, but for many other reasons he concluded that a Mexican route was more likely. He judged that "Krieger's route interpretation meets the criteria of thoroughness and objectivity" and went on to describe Krieger's research as "systematic" and a "careful reexamination of the Cabeza de Vaca journey."<sup>20</sup>

T. N. Campbell and T. J. Campbell also favored the Krieger path through south Texas and into Mexico, a decision based primarily on a detailed analysis of ethnographic data. The Campbells argued that Hallenbeck's route and similar northern routes cannot be correct because they would require Cabeza de Vaca to encounter various Texas Indians in parts of the state "where they obviously never lived."<sup>21</sup>

Similarly, William C. Foster has cited the evidence assembled by the Campbells and recent archaeological and anthropological work by Martín Salinas and C. Roger Nance to support the conclusion that the route of Cabeza de Vaca crossed the Rio Grande into Nuevo León. In the view of Salinas, Krieger's route is the "most realistic" with respect to the distribution of food and fresh water supplies available in northeastern Mexico. Nance agrees that Krieger's reconstruction of the journey is the "best interpretation" presently available but notes that it is based on "scant and ambiguous information" in the primary sources.<sup>22</sup>

The piñon evidence is therefore particularly important in determining the route, because the piñon distribution offers one of the most concrete clues to Cabeza de Vaca's location. The Mexican piñon (*Pinus cembroides*), moreover, is not edible in the manner described in the narratives, raising an issue that must be resolved.



None of the proponents of the southern routes directly confronted this point. The route interpretations published both by Davenport and Wells and by Krieger agree in placing Cabeza de Vaca's piñon region in the mountains near Monclova, Coahuila. But Davenport and Wells simply asserted that the "mountains of Coahuila are covered with piñón trees." Krieger stated that the trees can "be seen today on the ranges near Monclova" but likewise did not give many details, apparently because he regarded it as "a well-known fact to anyone familiar with this region of Mexico that piñons do grow on the highest ranges of eastern Coahuila." Unfortunately, neither Davenport and Wells nor Krieger gave any footnotes to botanical authorities, cited any anecdotal evidence, named which particular species of piñon is to be found, or entered into the question of whether piñons found in Mexico have very thin shells.<sup>23</sup>

Only two species, the New Mexico piñon (*Pinus edulis*) and the Mexican piñon (*Pinus cembroides*), were considered by previous scholars of Cabeza de Vaca's route. However, the modern scientific literature on the piñons of the southwest makes it clear to the present authors that a third piñon provides a better candidate for the pine nuts described by Cabeza de Vaca as "better than those of Castile, because they have very thin shells."<sup>24</sup> This variety is known as the "paper-shell piñon" (*Pinus remota*).

The characteristics of this variety are given in Table 3, which is compiled from modern studies by botanists not involved in the controversy over the route of Cabeza de Vaca.

TABLE 3 CHARACTERISTICS OF THE PAPER-SHELL PIÑON

**SCIENTIFIC NAME** *Pinus remota*

**COMMON NAMES** Paper-shell piñon, Remote piñon, Texas piñon

**HEIGHT** 10 feet to 25 feet tall

**HABITAT** found at low altitudes, in Texas as low as 1500 feet above sea level, and in Coahuila from about 3500 feet to 5500 feet above sea level

**RANGE**

primarily found in central and northern Coahuila;  
range also extends into western Nuevo Leon and eastern Chihuahua;  
found in Texas at the southwest corner of the Edwards Plateau in  
Edwards,  
Kinney, Real, Uvalde, and Val Verde counties;  
also found in trans-Pecos Texas in Pecos County on Sierra Madera and  
in Brewster County on the Glass Mountains, the Del Norte Mountains,  
and in Big Bend National Park

**CONES** 1 inch to 1 1/2 inches long

**THICKNESS OF SHELLS** 0.004 inch to 0.016 inch (0.1 mm to 0.4 mm) thick

"extraordinarily thin seed shells...unmatched by any other pinyon" (Bailey and Wendt)

"seed shells paper thin" (Bailey and Hawksworth)

"seed coat very thin...the very thin seed coat makes them especially attractive for human consumption" (Perry)

"their nuts have the thinnest shells of all pinyons" (Simpson)

**SOURCES:**

D. K. Bailey and Tom Wendt, "New Pinyon Records for Northern Mexico," *The Southwestern Naturalist*, XXIV (July, 1979), 390; Dana K. Bailey and Frank G. Hawksworth, "Pinaceae of the Chihuahuan Desert Region," *Phytologia*, LIII (April, 1983), 229; Jesse P. Perry, *The Pines of Mexico and Central America* (Portland, Oregon: Timber Press, 1991), 62; Benny J. Simpson, *A Field Guide to Texas Trees* (Houston: Gulf Publishing Company, 1988), 222.

This piñon was first described botanically in a 1966 article by Elbert L. Little as a variety (subspecies) of *Pinus cembroides* which differed "from the typical variety in the thin-shelled seeds." Little noted that a botanist in the 1840s had proposed for the typical Mexican piñon the scientific name *Pinus osteosperma*, indicating a pine with shells as hard as bone. By contrast, Little found that some of the newly described *Pinus cembroides* var. *remota* had seed shells as thin as 0.004 inch (0.1 mm), which is the thickness of a sheet of paper.<sup>25</sup>

In a 1979 article titled "New Pinyon Records for Northern Mexico," botanists Dana K. Bailey and Tom Wendt also remarked on "the extraordinarily thin seed shells of var. *remota* (unmatched by any other pinyon)" and first suggested that an "appropriate common name might be 'paper-shell pinyon.'" Another 1979 article by Dana K. Bailey and Frank G. Hawksworth argued that this tree should be elevated to the status of a separate species with the scientific name *Pinus remota*. Both of these articles pointed out as an additional distinguishing characteristic that *Pinus remota* was found most often at significantly lower elevations than the typical Mexican piñons.<sup>26</sup> Jesse P. Perry in 1991 also emphasized that the paper-shell piñon had "the distinction of growing at the lowest altitude of any of the piñon pines."<sup>27</sup> It is therefore possible that Cabeza de Vaca could have seen these trees in foothills or canyons near the base of a mountain range, without the necessity of climbing to higher elevations.

Cabeza de Vaca does not explicitly state whether he visited stands of piñon trees along the route, only that he was given the pine nuts to eat. However, his descriptive statements in the *Relación* regarding "small pine trees" with cones "like small eggs," combined with the remark in the Joint Report that the "cones of these are very small, and the trees are full of them, through those mountains, in quantities," suggest that he saw stands of the trees rather than merely receiving sacks of pine nuts in the villages.<sup>28</sup> This is entirely consistent with the low-elevation habitat of the paper-

shell piñon, a species that also matches Cabeza de Vaca's description with respect to the height of the trees and the size and shape of the cones.

The remaining important question is whether paper-shell piñons can be found in the mountains near Monclova, Coahuila, which is the piñon region advocated by Davenport and Wells and by Krieger.

Hallenbeck in 1940 corresponded with several botanical authorities and also collected anecdotal evidence from "individuals intimately acquainted with Coahuila that no species of nut-bearing pine is to be found in central or northern Coahuila. This, then, definitely disproves the Davenport-Wells route."<sup>29</sup>

Because of the importance of the piñons in determining Cabeza de Vaca's route, the present authors traveled to the mountains of Coahuila in the fall of 1996. Branches, cones, and nuts were collected from piñons on the flank of the Sierra La Gloria, at a site eight miles southeast of Monclova.<sup>30</sup> These specimens are identified as paper-shell piñon by several specific characteristics, including the height of the trees, the number of needles grouped per fascicle, the sizes of the cones and seeds, the low elevation at which the trees were found, and -- most importantly -- the paper-thin shells on the pine nuts. The paper-shell piñon found in Mexico lives up to its name, making Cabeza de Vaca's claim about the Indians' food preparation reasonable, which is not the case for either the typical Mexican piñon or the New Mexico piñon found along the Hallenbeck route.

These direct observations are corroborated by modern botanical authorities who place paper-shell piñons on the mountains near Monclova, Coahuila. In 1991 Jesse P. Perry published a map indicating that the paper-shell piñon is found throughout central and northern Coahuila,

including the Monclova region.<sup>31</sup> A similar distribution map can be found in a 1992 article by James Malusa on the biogeography of piñon pines.<sup>32</sup>

This abundant evidence indicates that Hallenbeck's conclusions about piñon distribution are seriously in error. Botanical studies describing the paper-shell piñon were not available to Davenport and Wells in 1919, Hallenbeck in 1940, or Krieger in 1955, because this tree was not recognized as a separate piñon variety until 1966. The common name "paper-shell piñon" was not coined until 1979, when it became recognized as a distinct species. However, Hallenbeck can be faulted for publishing a route interpretation that relied on the categorical (and demonstrably false) statement that "no species of nut-bearing pine is to be found in central or northern Coahuila."<sup>33</sup>

The exact path followed by Cabeza de Vaca will never be known with absolute certainty. However, the piñon evidence presented in this paper, based on modern botanical literature and field observations, provides strong support for the southern route as pioneered by Davenport and Wells, refined by Krieger, and endorsed by Chipman. Piñon pines do exist in the mountains of central Coahuila, and they can be found exactly on Cabeza de Vaca's route as projected by Krieger. They are paper-shell piñons with characteristics that match remarkably well the description given by Cabeza de Vaca more than four centuries ago.

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Southwest Texas State University, and Brooks Anderson and Ezequiel Agüero of Saltillo, Coahuila.

## NOTES

1 Cadwell Walton Raines, *Bibliography of Texas* (Austin: Gammel Book Co., 1896), xiv (quotation). Cabeza de Vaca's narrative was published in two editions, first as *La relacion que dio Aluar nuñez cabeça de vaca...* (Zamora, Spain : Augustin de paz y Juan Picardo, 1542) and then, with slight changes in the text, as *La relacion y comentarios del gouernador Aluar nuñez cabeça de vaca...* (Valladolid, Spain: Francisco fernandez de Cordoua, 1555). The Joint Report, based on information from the participants and compiled by Gonzalo Fernández Oviedo y Valdés, is available in a modern edition by Basil C. Hedrick and Carroll L. Riley, *The Journey of the Vaca Party* (Carbondale, Ill.: Southern Illinois University, 1974).

2 Donald E. Chipman, "In Search of Cabeza de Vaca's Route across Texas: An Historiographical Survey," *Southwestern Historical Quarterly*, XCI (October, 1987), 127-148.

3 Cleve Hallenbeck, *Alvar Núñez Cabeza de Vaca: The Journey and Route of the First European to Cross the Continent of North America, 1534-1536* (Glendale, Calif.: Arthur H. Clark Co., 1940).

4 Harbert Davenport and Joseph K. Wells, "The First Europeans in Texas, 1528-1536," *Southwestern Historical Quarterly*, XXII (October, 1918), 111-142, (January, 1919), 205-259.

5 Alex D. Krieger, "Un nuevo estudio de la ruta seguida por Cabeza de Vaca a través de Norte América" (Ph. D. diss., Universidad Nacional Autónoma de México, 1955).

6 Translation by the authors from the Spanish text of *La relacion y comentarios*, Valladolid edition of 1555, fol. xl, recto (quotation).

7 Translation by the authors from the Spanish text of the Joint Report found in Hedrick and Riley, *The Journey of the Vaca Party*, 139.

8 Translation by the authors from the Spanish text, "caxcaras muy delgadas," in *La relacion y comentarios*, Valladolid edition of 1555, fol. xl, recto (quotation).

9 At least one author, Adolph F. Bandelier, doubted that the shells of even *Pinus edulis* were thin enough to match Cabeza de Vaca's description. Bandelier speculated that there might exist another species of piñon "different from the northern kind." See Adolph F. Bandelier, *Hemenway Southwestern Archaeological Expedition: Contributions to the History of the Southwestern Portion of the United States*, vol. 5 (Cambridge, Mass.: John Wilson & Son, 1890), 57. As will be seen later in this paper, his skepticism was justified.

10 Brownie Ponton and Bates H. McFarland, "Alvar Núñez Cabeza de Vaca: A Preliminary Report on His Wanderings in Texas," *Quarterly of the Texas State Historical Association*, I (January, 1898), 180 (quotation).

11 Fanny Bandelier (trans. and ed.), *The Journey of Alvar Nuñez Cabeza de Vaca and His Companions from Florida to the Pacific, 1528-1536* (1905; reprint, New York: Allerton Book Co., 1922), 140.

12 Frederick W. Hodge (ed.), "The Narrative of Alvar Nuñez Cabeza de Vaca," in *Spanish Explorers in the Southern United States, 1528-1543* (New York: Charles Scribner's Sons, 1907), 96.



- 13 Hallenbeck, *Alvar Núñez Cabeza de Vaca*, 188 (1st quotation), 190 (2nd quotation).
- 14 Haniel Long, *Piñon Country* (New York: Duell, Sloan & Pearce, 1941), 23, 32 (quotation).
- 15 Cyclone Covey (trans. and ed.), *Cabeza de Vaca's Adventures in the Unknown Interior of America* (1961; reprint, Albuquerque: University of New Mexico Press, 1983), 8 (quotation), 109.
- 16 Ronald M. Lanner, *The Piñon Pine, A Natural and Cultural History* (Reno: University of Nevada Press, 1981), 89.
- 17 Stewart L. Udall, *To The Inland Empire, Coronado and Our Spanish Legacy* (Garden City, N.Y.: Doubleday & Company, 1987), xiii (1st quotation), 59 (2nd quotation).
- 18 Enrique Pupo-Walker (ed.) and Frances M. López-Morillas (trans.), *Castaways, the Narrative of Alvar Núñez Cabeza de Vaca* (Berkeley: University of California Press, 1993), xvi.
- 19 Martin A. Favata and José B. Fernández, *The Account: Álvar Núñez Cabeza de Vaca's Relación* (Houston: Arte Público Press, 1993), 16 (quotation), 136.
- 20 Chipman, "In Search of Cabeza de Vaca's Route across Texas," 142 (2nd, 3rd, and 4th quotations), 148 (1st quotation).
- 21 T. N. Campbell and T. J. Campbell, *Historic Indian Groups of the Choke Canyon Reservoir and Surrounding Area, Southern Texas* (San Antonio: Center for Archaeological Research, University of Texas at San Antonio, 1981). See also the letter from T. N. Campbell cited by Chipman, "In Search of Cabeza de Vaca's Route across Texas," 146 (quotation).

22 William C. Foster (ed.), Ned F. Brierley (trans.), *Texas and Northeastern Mexico, 1630-1690*, by Juan Bautista Chapa (Austin: University of Texas Press, 1997), 9-10, 206; Martín Salinas, *Indians of the Rio Grande Delta* (Austin: University of Texas Press, 1990), 73, 84 (quotation), 118; C. Roger Nance, *The Archaeology of La Calsada* (Austin: University of Texas Press, 1992), 2 (quotations), 3. As part of their arguments for the southern route, Foster, Salinas, and Nance all note that a reference to ground maize by Cabeza de Vaca is consistent with evidence that maize agriculture was practiced in northeastern Mexico in the sixteenth century.

23 Davenport and Wells, "The First Europeans in Texas," (January, 1919), 243 (1st quotation); translation by the authors from the Spanish text of Krieger, "Un nuevo estudio de la ruta seguida por Cabeza de Vaca," 123 (3rd quotation), 123-124 (2nd quotation),

24 Translation by the authors from the Spanish text ("mejores que los de Castilla: porque tienen las caxcaras muy delgadas") of *La relacion y comentarios*, Valladolid edition of 1555, fol. xl, recto (quotation).

25 Elbert L. Little, "A New Pinyon Variety from Texas," *Wrightia*, III (May, 1966), 181-183, 184 (quotation), 185-187. A ream of 500 sheets of standard 20 lb. copier paper is 2 inches thick, making each sheet of paper 0.004 inch thick.

26 D. K. Bailey and Tom Wendt, "New Pinyon Records for Northern Mexico," *The Southwestern Naturalist*, XXIV (July, 1979), 389, 390 (quotations); D. K. Bailey and Frank G. Hawksworth, "Pinyons of the Chihuahuan Desert Region," *Phytologia*, XLIV (September, 1979), 129-133.

27 Jesse P. Perry, *The Pines of Mexico and Central America* (Portland, Oregon: Timber Press, 1991), 62 (quotation).

28 Translation by the authors from the Spanish text ("pinos chicos" and "como huevos pequeños") of *La relacion y comentarios*, Valladolid edition of 1555, fol. xl, recto (1st and 2nd quotations), and the Spanish text ("las piñas dellos son muy chiquitas, é los árboles llenos por aquellas sierras en cantidad") of the Joint Report as found in Hedrick and Riley, *The Journey of the Vaca Party*, 139 (3rd quotation).

29 Hallenbeck, *Alvar Núñez Cabeza de Vaca*, 298 (quotation).

30 Samples were collected from four trees in a stand of paper-shell piñons near 101°18' 40" west longitude, 26°48' 40" north latitude, at an elevation of 3450 feet above sea level. This site is in Cañon El Chilpitin, a canyon which extends into the northwest flank of Sierra La Gloria, the main peaks of which rise above 7000 feet. Monclova and Cañon El Chilpitin appear on 1:50000 scale topographic maps, ....., G-14-A52, and ....., G-14-A53, prepared by Estados Unidos Mexicanos, Secretaria de ....., Comision de .....

31 Perry, *Pines of Mexico*, 62.

32 James Malusa, "Phylogeny and Biogeography of the Pinyon Pines (*Pinus* subsect. *Cembroides*)," *Systematic Botany*, XVII (January-March, 1992), 43. Botanists hypothesize that the present stands of *Pinus remota* are relicts of the cooler, wetter Pleistocene epoch 20,000 years ago, when parts of Texas and northern Mexico were more widely covered with pine forests.

The distribution maps of Perry, 62, and Malusa, 43, are consistent with another brief reference to piñons in the Joint Report. After leaving the settlement where piñons were first encountered, the Spaniards traveled for many days, finally encountering more Indians who "gave them piñon nuts in quantities"; translation by the authors from the Spanish text ("les dieron piñones en cantidad") of the Joint Report as found in Hedrick and Riley, *The Journey of the Vaca Party*, 139. The botanical maps show stands of *Pinus remota* extending northwest of Monclova, and therefore this piñon would be encountered again by Cabeza de Vaca along the route as projected by Krieger.

33 Hallenbeck, *Alvar Núñez Cabeza de Vaca*, 298 (quotation). Other reasons for favoring the Krieger route over the Hallenbeck route include arguments based on the distance traveled to the piñon region and on the mineral resources mentioned in the narratives.

According to the Joint Report, a village near the piñon region was reached after the travelers had "walked 150 leagues [approximately 450 miles] more or less, from where they began their journey"; see Hedrick and Riley, *The Journey of the Vaca Party*, 54. Both Krieger and Hallenbeck considered the starting point for the transcontinental journey to be in the prickly pear fields south of San Antonio. Along the Krieger route, the distance to Monclova can be estimated to be between 375 and 450 miles. We calculated the smaller distance by considering the route as a series of a few straight-line segments and then added 20 percent to obtain the larger figure, which is probably more realistic because it allows for the windings of the path in valleys, along the banks of rivers, and around obstacles. For the use of 20 percent as the conventional correction in such cases, see Charles W. Hackett (trans. and ed.), *Pichardo's Treatise on the Limits of Louisiana and Texas* (4 vols.; Austin: University of Texas Press, 1931-1946), I, 311-312. The more realistic estimate of distance along the Krieger route is in good agreement with the distance given in the Joint Report.

Along the Hallenbeck route, we estimate that the distance traveled from the starting point near San Antonio to the piñon region in New Mexico measures at least 660 miles and is more realistically closer to 790 miles, since much of this path follows winding rivers. The argument from

distance traveled to the piñon region therefore provides more evidence for preferring the Krieger route over the Hallenbeck route.

On the same day that Cabeza de Vaca reached the piñon region, his *Relación* describes crossing a mountain where the rocks are scoria of iron. Hallenbeck dismissed the reference to iron by saying "this datum may be ignored as worthless" on the grounds that Cabeza de Vaca "at various points in his narrative gives ample evidence he was no metallurgist"; see Hallenbeck, *Alvar Núñez Cabeza de Vaca*, 187. In contrast, the geological evidence from central Coahuila directly supports Cabeza de Vaca's narrative. Rocks resembling iron slag were collected by the authors from several of the mountains south and southeast of Monclova, exactly as would be expected along the route as laid out by Krieger.

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