Nile Delta: The Defunct Pelusiac Branch Identified

Abstract. *The course of the ancient Pelusiac branch of the Nile River has been traced on a deltaic plain east of the Suez Canal, between the El Baqar Canal and Tell el Farama (ancient Pelusium). Two minor distributaries branched northward. The critical stage in the process of the silting up of the lower reaches of the Pelusiac branch, due to prograding beach accretion, occurred around A.D. 25. Ancient ruins in the area are closely associated with the courses.*

Seven major deltaic branches of the Nile River are mentioned in various historical documents and in ancient maps. Five of them have degenerated and have silted up in the course of history, whereas two, the present-day Damietta and Rosetta branches, remain active. The northeasternmost of these defunct branches, which is also the one best known, was the Pelusiac branch at the mouth of which the city of Pelusium was situated. The branch and the city served as the eastern gates of Egypt, opening to the highway leading east, the Via Maris, making possible trade and communication with the ancient Asian kingdoms.

The earliest evidence for the existence of different Nile arms is found depicted on the walls of the temple of Seti I at Abydos (13th and 14th centuries B.C.). One of the branches depicted there, called the Water of the Sun, has been identified by Gardiner (*1*) with the Pelusiac (Bubastite) branch; its lower reach is the Water of Horus, Shihor of the Bible (Jeremiah 2:18). Herodotus (450 B.C.) mentioned the Pelusiac branch in his description of the Nile Delta (*2*), and of events that took place near the city of Pelusium in the Egyptian-Persian war. The course of the Pelusiac branch and the location of the city of Pelusium are also found in maps attributed to Ptolemy (2nd century A.D.) (*3*), in the Peutinger Table (Tabula Peutingeriana) (4th century A.D.), and in the Madaba mosaic map (6th century A.D.). From then on until the 12th century we find evidence (*4*) referring to a populated Farama—ancient Pelusium (*5*), yet no mention of an active Pelusiac branch. The various reconstructions of the Pelusiac distributary course in the northeastern corner of the delta, as they are drawn in maps dating from the 15th to 18th centuries A.D. (*6*), are based on ancient data available then and clearly not on field evidence. None of these maps is correct. In modern works, for example, in reports by Gardiner (*7*), De Bellefond (*8*), Schleiden (*9*), and Shafei (*10*) we also find the course erroneously delineated, and there are some variations from one work to another.

A recent attempt (*11*) to locate the branch, based on the mapping of zones of greater heat capacity with the aid of high-resolution infrared radiometry, produced no satisfactory results. The identified zones are actually areas of marshes located south of the deltaic plain.

Throughout the area west of the Suez Canal, the irrigation, drainage, and navigation systems have confused any sign of the natural course almost beyond recognition. East of the Suez Canal the situation is even more complicated as a result of the flooding and salt deposition over the area that occurred after the excavation of the canal. It is in this part of the delta, east of the Suez Canal, that the final eponymous section of the Pelusiac branch can now be identified.

The area is bordered in the south by a dune ridge, which might be controlled by the presence of a buried structural ridge (*12*). The area is a wide plain reaching, at most, 5 m above sea level. Most of the surface is covered with a salt crust. Only a few ruins are scattered about the area.

The surveyed area comprises two distinct parts. The southern part is a delta plain composed of fine-grained, muddy, deltaic sediments; most of the area lies 1 to 2 m above sea level. The northern part is a strand plain built of very low (some tens of centimeters) and ancient beach ridges composed of coarse-grained clastic sediments. The northern part of the strand plain is covered by the Malaha lagoon. No active stream beds cut through the plain. Parts of the area are flooded by seawater during heavy storms.

In trying to locate the course of the Pelusiac distributary, we made certain assumptions: (i) since all the attempts to trace the Pelusiac branch marked on ancient maps and documents have concentrated on this area, it is indeed plausible that the course did run this way; (ii) the ruins in the area are expected to have been built either along the course of the Pelusiac branch or in its close vicinity; (iii) drainage canals in the delta area usually follow a hydrographic system, and the finding of their remains may reveal the contemporaneous system; and (iv) a defunct river channel might leave some distinguishable morphological features indicative of its width and continuity.

In keeping with these considerations, we started looking for the Pelusiac distributary in the continued direction of the El Baqar Canal which approaches the Suez Canal from the west. We found the course we were looking for in the middle of the deltaic plain area, in the form of a broad, continuous depression shaped like a river several centimeters lower than the sur-

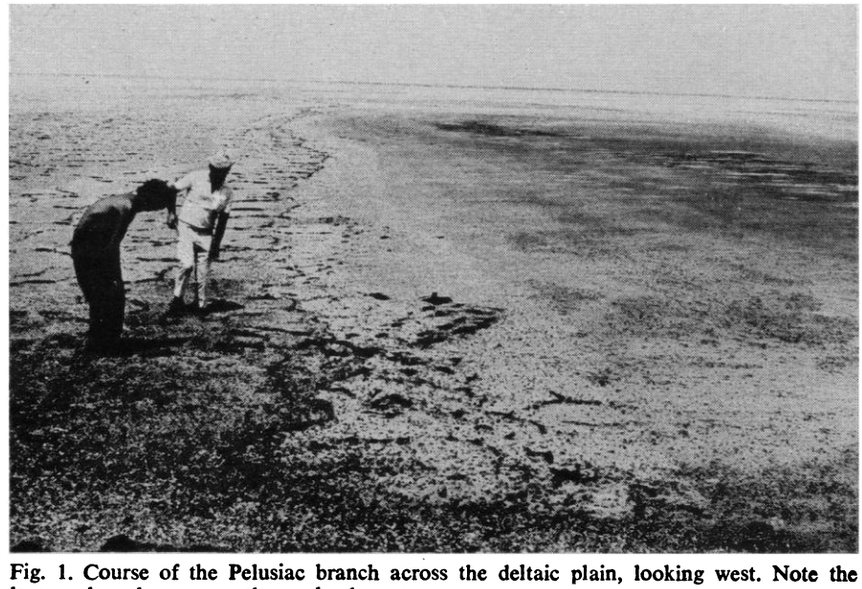

Fig. 1. Course of the Pelusiac branch across the deltaic plain, looking west. Note the large salt polygons on the embankment.

rounding plain and, as a result of recent seasonal sea floods, distinct in the following characteristics. (i) Moisture is higher in the soil filling the channel than in that of its banks. (ii) Most of the surveyed area is covered by a thin (1 to 2 cm) salt crust, which cracks into large polygons. Along the course, however, the crust is more than twice as thick and the polygons are poorly developed (Fig. 1). (iii) In some places along the course the crust in the center of the depression is composed exclusively of halite crystals, whereas at the banks gypsum crystals are associated with the halite. (iv) Reddish algae are concentrated (in winter) in a line along the course margins. (v) Flotsam, consisting of planks, pumice, and tar brought by recent sea floods is aligned along the course margins.

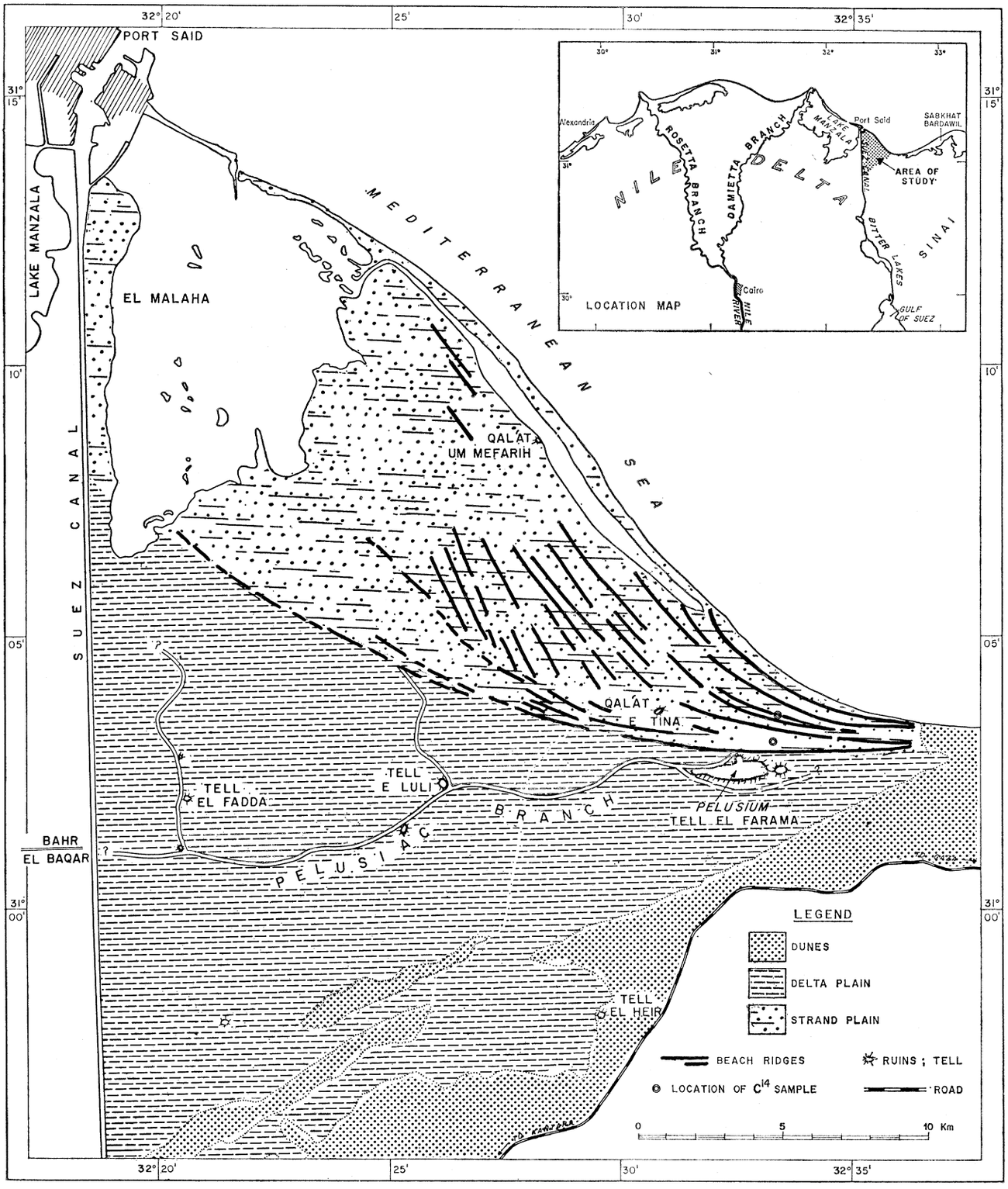

Fig. 2. Northeastern corner of the Nile Delta showing the lower course of the defunct Pelusiac branch.

On the basis of our initial assumptions and the above characteristics, we managed to trace the entire lower course of the Pelusiac branch, as well as two minor distributaries branching off toward the north (Fig. 2). Color differences between the depression bottom and its margins, attributable to differences in the degree of surface roughness, were helpful in mapping certain parts of the courses from aerial photographs. The defunct course of the Pelusiac branch, which follows the general direction of the El Baqar Canal, is intersected by the Suez Canal 26 km south of Port Said (as a result of the excavation of the Suez Canal the crossing point itself cannot be distinguished). The course continues in a direction from west to east up to the northern side of Tell el Farama, ancient Pelusium. There are vague signs that it bifurcated above the tell and passed also south of it. The length of the course from the canal to the ruins is about 23 km, and the width of the depression varies from 80 to 100 m. (The widths of the Damietta and Rosetta branches are about 300 and 450 m, respectively.) The distributary flowed slightly north of a line from west to east and displays three very subdued meanders, the total belt being less than 2 km wide.

The more western of the two minor distributaries branches off about 3 km east of the Suez Canal where a small and unknown ruin marks the juncture. It runs north to Tell el Fadda and onward until it disappears under a thick recent salt crust. Its total length is 7.6 km. The eastern minor distributary branches off about 10 km west of Tell el Farama, where the juncture is marked by Tell e Luli, and runs for about 4.7 km until it reaches the strand plain. The width of each of the minor distributaries is about 80 m. The minor courses show slightly more developed meanders than the main course, and their branching-off is set at a normal angle.

The ruins scattered about the area (*13*) are immediately adjacent to either the main Pelusiac branch or to the minor distributaries. Tell el Fadda and another small ruin north of it are situated on the eastern bank of the western distributary. Tell e Luli and a ruin west of it are located on the northern and southern banks of the main branch, respectively, and Tell el Farama rises south of what must have been the mouth of the Pelusiac branch. A quay-like structure juts out north of the tell.

In addition to the river courses described above, other channel courses branch off the Pelusiac distributary. They differ from the former in dimensions and patterns and are probably tributary gullies. We also came across an irrigation canal system, particularly south of the Pelusiac branch. These channels were not mapped in the study presented here. Unsuccessful attempts at cultivation (probably dating from the 19th century A.D.) remain visible along the main distributary course.

The strand plain which borders the deltaic plain in the north consists of numerous bundles of very low, accretional ridges. These beach ridges are composed of fine- and coarse-grained sands, shell fragments, and accumulations of unbroken shells.

The bundles of beach ridges which are set at slight mutual angles and which sometimes truncate one another run parallel to the present shoreline. The width of the strand plain varies from 1 km in the east to 12.5 km in the west where it is covered by the Malaha lagoon. The ridge bundles continue for about 25 km; their continuation in the Malaha lagoon is a series of islands running in the same direction. Individual ridges can be followed for some kilometers. The ridges are only a few tens of centimeters higher than their surroundings, spaced 10 to 30 m apart, and their widths vary from 5 to 30 m. The intervening depressions are usually salt-encrusted, a feature which sets them off as prominent furrows. Neither the minor distributaries nor the main branch continues across the strand plain.

It is evident that sands were deposited by the prevailing west-east longshore current (*14*) in front of the deltaic plain along the ancient shorelines, silting up the mouths of the distributary channels. Deposition of the fine-grained load occurred, therefore, in the lower reaches of the channels rather than in the open sea. The succeeding development of beach ridges caused the seaward advance of the shoreline. The beach ridges truncated distributaries already defunct, as in the case of the eastern minor distributary, and brought about a shifting of the course of the Pelusiac branch, thus accelerating its degeneration. The age of the earliest beach ridge (the one farthest inland) therefore marks a crucial stage of stream decay which resulted in degeneration of the lower reaches of the branch.

Carbon-14 analyses (*15*) of mollusks taken from the upper part of a beach ridge (Fig. 2), far from the present shoreline, gave an age of 1925 ± 90 years (A.D. 25). Mollusks from a beach ridge closer to the present shoreline gave an age of 345 ± 100 years (A.D. 1605). Archeological findings (*13*) also point to a retreat of the sea. Ruins at Qal'at e Tina, situated on a beach ridge far inland, are not older than the Roman period, whereas the oldest remains discovered in Qal'at Um Mefarih, situated on a beach ridge close to the present shoreline, are Mamelukean (A.D. 1250–1517).

We thus conclude that the critical stage in the process of degeneration of the lower reaches of the Pelusiac branch occurred around A.D. 25. The natural process of silting up, until the final stage of complete disappearance, was accelerated because of the neglect of the local drainage system as a result of wars and a gradual depopulation of the area.

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References and Notes

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16. We thank E. Zohar, I. Perath, and Y. Levy for their helpful comments on the manuscript. We also thank S. Ashkenazi, Z. Cikurel, V. Arad, and S. Levy for technical assistance.
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16 November 1972