Achaemenid Royal Road Network Analysis

Purpose: Herodotus claims that a Persian royal courier could carry a message through the Royal Road (Susa to Sardis) in seven to nine days. Using QGIS to model the geographic distances of the Royal Road and drawing on independent sources for comparative courier speeds, I test whether the resulting travel times match Herodotus's claims.

Background:

The Royal Road was the primary trade and communications network of the Achaemenid Persian Empire, expanded by Darius I around 500 BCE along older Assyrian trade routes. It ran roughly 2,400 to 2,700 kilometers from Susa, a principal administrative capital in southwest Iran, across Mesopotamia and Anatolia to Sardis. Its purpose was to quickly dispatch information (king's orders, intelligence, reports, etc.) from the imperial core to the outer satrapries (administative regions). It was lined with relay stations known as the *angarium*, where fresh horses and riders waited roughly a day's ride apart so that a message could pass continuously from one rider to the next without pause.[1]

In Histories 8.98, Herodotus describes the system directly: the Persians station a horse and rider for each day of the journey, and the first rider hands the message to the second, the second to the third, and so on down the line, "like the torch-race" the Greeks held. Herodotus states that the relay couriers covered this Susa-to-Sardis distance in seven to nine days.

Hypothesis: A GIS-based route reconstruction using historical station coordinates and leg distances will produce a Susa-to-Sardis travel time consistent with Herodotus's 7–9 day estimate.

Experiment: The station points were compiled from Herodotus's account, with coordinates for each taken from the Pleiades gazetteer of the ancient world (pleiades.stoa.org). These were entered as a CSV and loaded into QGIS as a point layer, with each point tagged with a road-order number giving its sequence from Susa. The stations were then connected in order by straight-line segments as approximation. Summing these segments gives a total modeled length of about 2,400 kilometers, close to the roughly 2,500 implied by Herodotus's 450 parasangs, agreeable since the straight-line approximation ignores the road's real curves. The output of these path lengths:

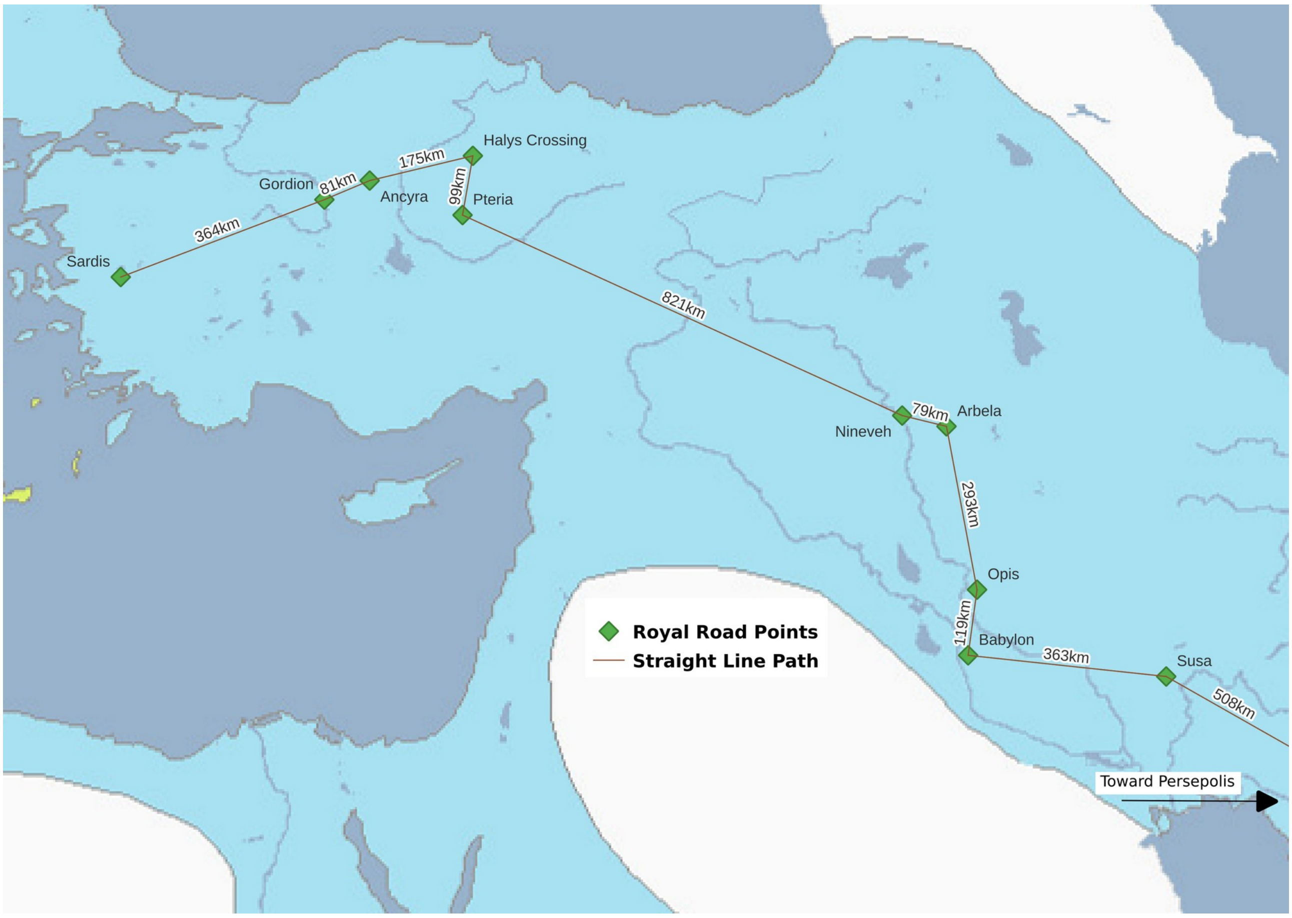

Figure 1

Every coordinate point seen in Figure 1 perfect relation with each other and the measurements labelled are real life values calculated by QGIS. Those numbers are put on top of a rough approximation of the Achaemenid Empire's territorial expanse at 500 BCE. By exporting the CSV's coordinates into a GeoPackage, their attribute table could be edited for further exploration.

Thus, I then removed the Persepolis point and gave ordered numbering starting at Susa to analyse the route from Susa to Sardis. The Points to Path tool connected them in order into one line, and Explode Lines split that line into one segment per leg. For accurate lengths, the project ellipsoid was set to WGS 84, forcing true ground distances instead of the distorted Web Mercator values at these latitudes. The Field Calculator then added a length field using $length divided by 1000, giving each leg in kilometers.

As there was no surviving Persian record of the couriers' actual speed, the rate had to be drawn from a comparable relay system. The Roman *cursus publicus* is the closest. Both systems had fixed stations a short ride apart where tired horses were swapped for fresh ones so the message kept moving. The crucial difference is historical documentation. We have records from the Romans that document their system’s law codes, regulations, and histories that gives us the information in regards to journey times, giving us a speed to use to test Herodotus’ claims about the Achaemenid’s Royal Road. The Romans put ordinary official traffic near 75 km per day and the fastest urgent relays around 240 km per day.[2] In my experiment, I chose 250 km per day as the absolute ceiling, using it as a best-case courier speed.

With the courier speed fixed, travel time was calculated inside the same attribute table. Working in road order from Susa, the individual leg lengths from Figure 1 were added up cumulatively into a new field, "dist_from_susa_km", so each station carried the total distance a courier would travel from the capital to reach it, rather than its straight-line distance from Susa alone. That cumulative distance was then converted to time with a second Field Calculator expression, "dist_from_susa_km / 250", dividing each station's distance by the 250 kilometers per day ceiling and writing the answer to a "days_courier" field evaluated for every station at once. The logic is simply distance over speed: kilometers from Susa divided by kilometers per day yields days from Susa. Finally the points were labelled from this field so each station shows its name above its courier travel time on the shaded-relief map.

Results: The travel-time output is given below, with labels on each station on the Susa-Sardis route with its "days from Susa" numerical value. As explained in the prior section, they were calculated by dividing cumulative distance from Susa by the 250 km/day speed. Susa starts at day 0, with time increasing westward.

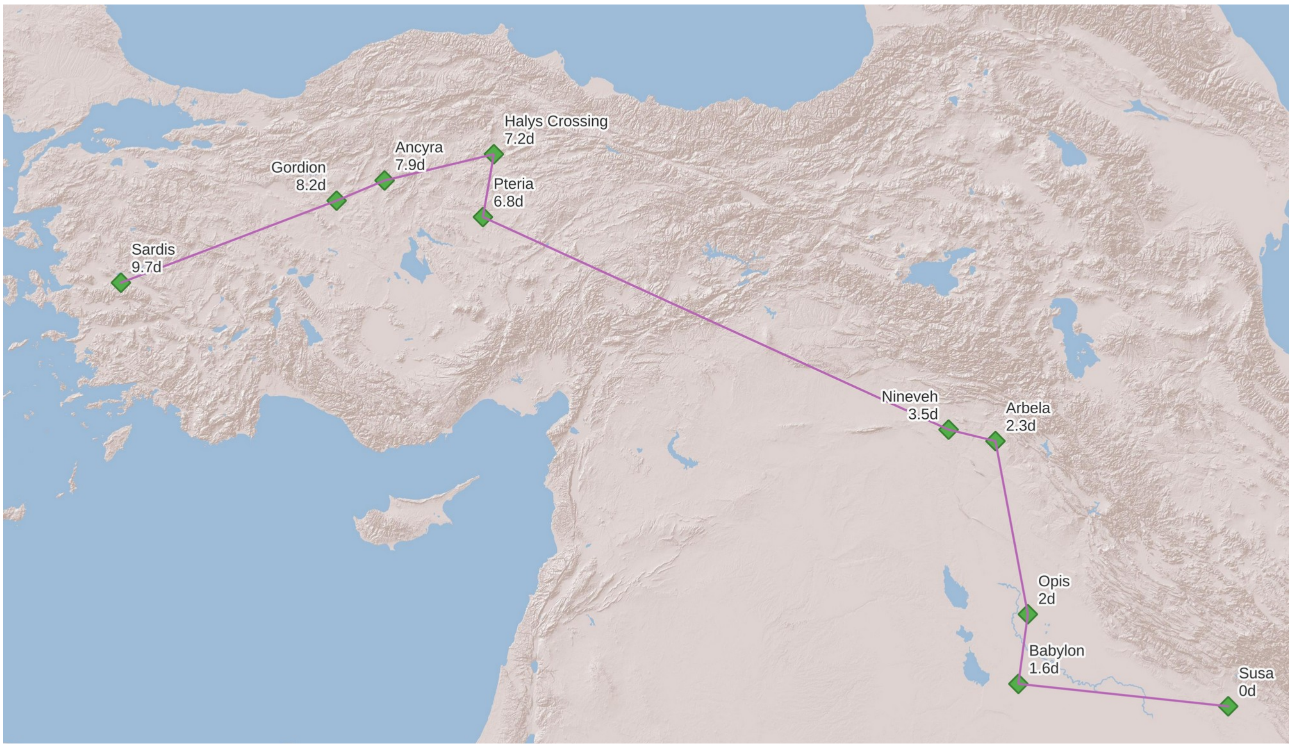

Figure 2

Because travel time is cumulative distance divided by a constant speed, the days accumulate linearly along the route: every kilometer adds the same fixed increment, and each station's value is the running total of the legs behind it. The spacing between the labelled figures therefore reflects leg length directly. Across Mesopotamia, where stations sit close together, the values rise in small steps, and the first four stations from Babylon to Nineveh all fall within three and a half days of the capital. The long single leg across the Anatolian interior then adds more than three days at once, carrying the route from 3.5 days at Nineveh to 6.8 at Pteria and on to 9.7 at Sardis.

The station values show how unevenly the empire connected to its capital. The four Mesopotamian stations sat within a narrow band, from Babylon at 1.6 days to Nineveh at 3.5, a spread of under two days across the whole core. The western frontier lay far outside that band: Nineveh to Sardis added about 6.2 days, more than three of them in the single leg from Nineveh to Pteria. The result was a core the center could reach in two to three days and a frontier eight to ten days away, a gap that came from raw distance rather than any slowing of the courier.

Conclusion:

At best-case speed the reconstructed road delivers a message from Susa to Sardis in 9.7 days, past the upper bound of Herodotus's seven-to-nine-day claim. The gap is small but the direction is what matters, because every assumption in the model was set to favor Herodotus and still could not reach his number. The 250 km/day courier rate is a ceiling taken from the fastest recorded Roman relay dispatches rather than an average, so a realistic pace would only be slower. The route was measured as straight-line segments between stations, ignoring the road's real curves, mountain passes, and river crossings, so the modeled length of about 2,400 kilometers already falls short of the roughly 2,700 the historical road is thought to have run. Both simplifications shorten the journey, and both can only push the true travel time higher than 9.7 days. A longer winding road ridden at a more sustainable pace would have taken longer still.

The hypothesis therefore fails: the reconstructed geography does not reproduce the seven-to-nine-day figure, even under conditions deliberately set in its favor. Since the courier speed was drawn from independent Roman evidence rather than from Herodotus, the check is external rather than circular, and the failure points to the claim itself rather than to the method. The likeliest explanation is that the figure was never a measured delivery time but an idealized one, describing the system at its theoretical best. Read this way, Herodotus preserves a real memory of an unusually fast imperial post with a more impressive number than the geography can bear.

What the model does establish firmly is how loosely the western edge of the empire was tied to its center. The Mesopotamian core formed a tight cluster, every station from Babylon at 1.6 days to Nineveh at 3.5 sitting within about two days of one another, a region the capital could manage almost as a single unit. Western Anatolia was a different world: the long leg beyond Nineveh added over three days at once, and Sardis lay 9.7 days out, four to five times farther in time than the entire Mesopotamian core. That gap came from raw geography, not any slowing of the courier. Orders and responses to trouble reached the western provinces last and slowest, so the region most exposed to the Greek world was also the hardest for the center to control. The Ionian Greek cities sat at exactly this weak point, far enough from Susa to resist central authority when they chose to.

Endnotes

[1] Briant, Pierre. From Cyrus to Alexander: A History of the Persian Empire. Eisenbrauns, 2002; Graf, David F. “The Persian Royal Road System.” In Achaemenid History VIII, edited by Heleen Sancisi-Weerdenburg et al., 1994.

[2] A. M. Ramsay, “A Roman Postal Service under the Republic,” *JRS* 15 (1925): 60–74; Anne Kolb, “Transport and Communication in the Roman State: The *cursus publicus*,” in *Travel and Geography in the Roman Empire*, ed. Colin Adams and Ray Laurence (London: Routledge, 2001), 95–105.