Harbor areas at ancient Troy: Sedimentology and geomorphology complement Homer's *Iliad*

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ABSTRACT

For at least two thousand years scholars have debated the location of Troy and the events and geographic features described in Homer's *Iliad*. Geologic evidence is used to present a series of maps of the Trojan plain that show the geomorphic changes over the past six millennia. The geologic evidence correlates very well with the relevant Homeric geography.

Keywords: Troy, harbors, archaeology, sedimentary environments, facies.

INTRODUCTION

The debate concerning the paleogeography of Homeric Troy has involved scholars for more than two millennia. In antiquity, Strabo (in his *Geography*) devoted a number of passages to it. Maclaren (1822) realized that in Homeric time the coast at the mouth of the Scamander and Simois Rivers was well inland of its present position; nevertheless, he drew a map of the ''Ancient Coast and Greek Camp'' with the Greek camp at the nineteenth-century mouth of the Scamander. Fraser (1937) credited A. Brückner with the suggestion that the mouth of the Scamander would have presented an unfavorable topography for the Greek camp.

The region in question contains an extensive depositional record of the evolving Holocene landscapes (Fig. 1). To document the landscape changes over time we began a systematic drilling program in 1977. This has continued ever since, directed by I. Kayan (see Kraft et al., 1980; Kayan, 1991, 1995, 1996, 1997). To us, sedimentary environments of deposition form both geomorphic features and stratigraphic units. Thus, the paleoenvironments we have mapped have allowed us to test phrases in the *Iliad* and to specify areas that could have served as harbors for ancient Troy and, indeed, for the Greek camp and other landforms of the *Iliad*. Nothing that our research has discovered negates descriptions in the *Iliad*.

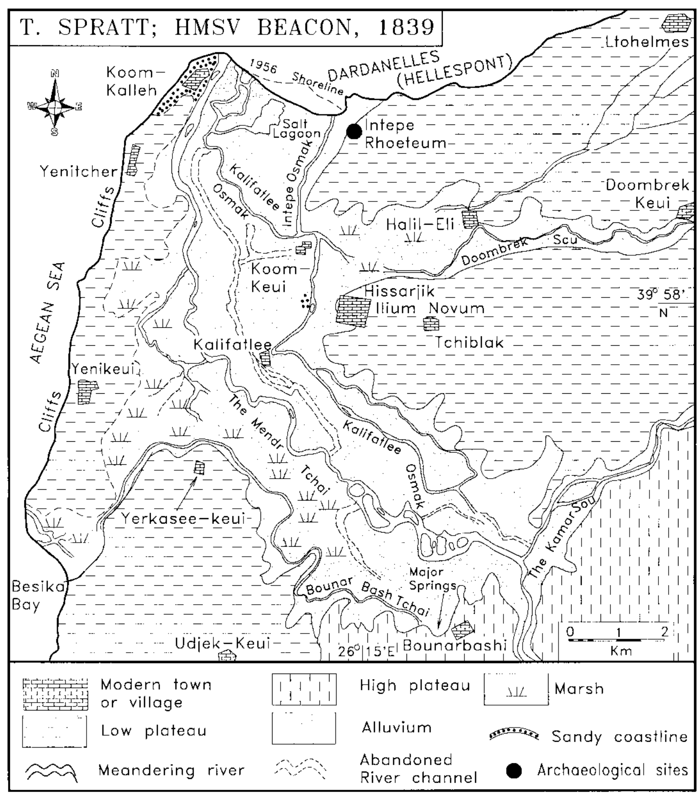

Figure 1. T. Spratt (1839) mapped Kara Menderes (Scamander) River and Dumrek (Simois) River floodplains, showing currently active river channels and past variants, including backswamps. Since then, massive flood-control and irrigation canals have dramatically altered natural settings of floodplain and deltaic swamps and lagoons (see also Kraft et al., 1980). Hissarjik = modern name (Hissarlik); Ilium Novum = new (Roman) Troy.

SEDIMENTARY FACIES ANALYSIS AND PALEOGEOGRAPHIC FEATURES OF THE TROJAN PLAIN

The abundant literature on sedimentary facies analysis makes clear the importance of determining lateral and vertical facies distributions in terms of possible conformable adjacent environments versus those less probable or unlikely. In the Mediterranean littoral environment the nearshore normal saline faunas are frequently in complex juxtaposition to brackish and freshwater facies (lithosomes) (Kraft et al., 2001). Further, in the thin alluvial veneer of lower delta floodplains, new river channels incise below sea level, creating a situation whereby deltaic sands may contain older shells mixed with, or in juxtaposition to, younger shells. Thus, older shells can be transported seaward, whereas younger shells are rarely, if ever, transported landward in quiescent delta regions. Therefore we should emphasize the youngest landward mollusks and their radiocarbon dates when making paleo-

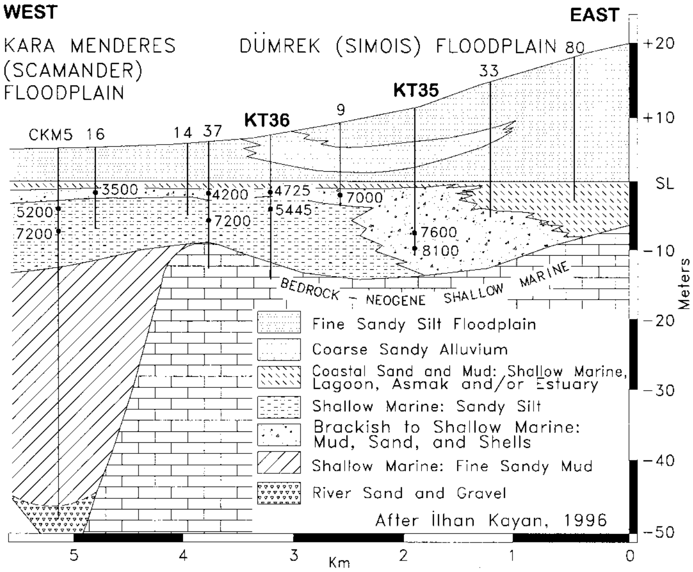

Figure 2. Axial cross section of Simois River floodplain to north of Troy (line of section in Fig. 6) showing marine, deltaic coastal, and floodplain strata. Radiocarbon dates shown are from brackish to marine pelecypod *Cerastoderma edule* (edible clam).

geographic reconstructions. Stanley (2000) discussed similar concepts involving many forms of mixing older and younger carbon in deltas.

The predominant sediments in the ancestral Troia Bay were distal and proximal prodelta muds that can be differentiated into clay-silt units and sandy silt units nearer to delta sediment sources (Kraft et al., 1980) (Figs. 2 and 3). Sedimentation rates were extremely low, even at the foot of the cliff faces such as at Hissarjik (Troy) during the Neolithic through Middle Bronze Ages (Kayan, 1995, 1996, 1997). The deposition of thin sedimentary strata in lagoonal, marsh, swamp, and distributary environments overrode the shallow-marine muds and finally infilled Troia Bay. The immediate coastal zone included clastic silt and clay deposits in lagoons, marshes, and interdistributary backswamps. Redistribution of the river-distributary sands was limited by the very low wave activity in this long-term sheltered marine embayment.

Yang (1982) identified five biofacies on the basis of microfaunal analysis of seven drill cores: (IA) fluvial, including freshwater charophytes; (IB) marsh or coastal swamp and tidal creeks, variable seasonally from freshwater to brackish; (II) nearshore restricted-marine to brackish-marsh and shallow-marine embayments, and lagoons; (III) brackish to moderately saline lagoons, estuaries, or marshes (with rare freshwater incursions); and (IV) very shallow nearshore marine embayments or lagoons with variable salinities and water depth to 40 m.

We can posit an extremely irregular delta coastline with constantly varying distributaries interspersed with subsiding older distributary levees and swamps, brackish to saline lagoons, and bypassed flanking ponds or lakes progressing from saline to brackish to freshwater. Water depths in such irregularly embayed waters were frequently ~1 m and could vary to 3–4 m. As the delta coast approached the Dardanelles, littoral currents and increased wave action sorted sands into nearshore shoals and possibly thin beaches, although no barrier lineaments are evident on the lower Scamander delta (Kraft et al., 1980). In eastern Greece, the Sperchios River delta is prograding into low-wave-energy shallow waters of the Gulf of Malia. Here, meandering river levees and backswamps and the coastline, with its multiple birds-foot distributaries, irregular shaped bays, and pervasive coastal marshes, form a modern analog to our interpretation of the paleogeographies that surrounded ancient Troy (Kraft et al., 1987). Our analogous modern floodplain (A.D. 1839) includes multiple river channels plus the older abandoned channels that were reactivated during flood times (Fig. 1). However, today, massive agricultural engineering of the fertile floodplains has obliterated much of the natural setting. With as much as 20 m of alluvium on the southern Scamander floodplain, we cannot hope to locate the river channels of antiquity. However, we can assert with confidence that river channels shifted frequently throughout the past six millennia.

We interpret lateral and vertical sedimentary environmental lithosome geometries through the use of present surficial lineaments, our subsurface drill-core data, limitations imposed by archaeological sites, and passages from historical and classical literature. Figure 4 shows our interpretation of geomorphologies in the time of Strabo, and Figure 5 delineates geomorphologies in the time of Homer's *Iliad*. Figure 6 presents the geometry of the Troy embayment during Late Neolithic–Early Bronze Age, ca. 5500–5000 yr B.P. Kum Tepe, a Neolithic site,

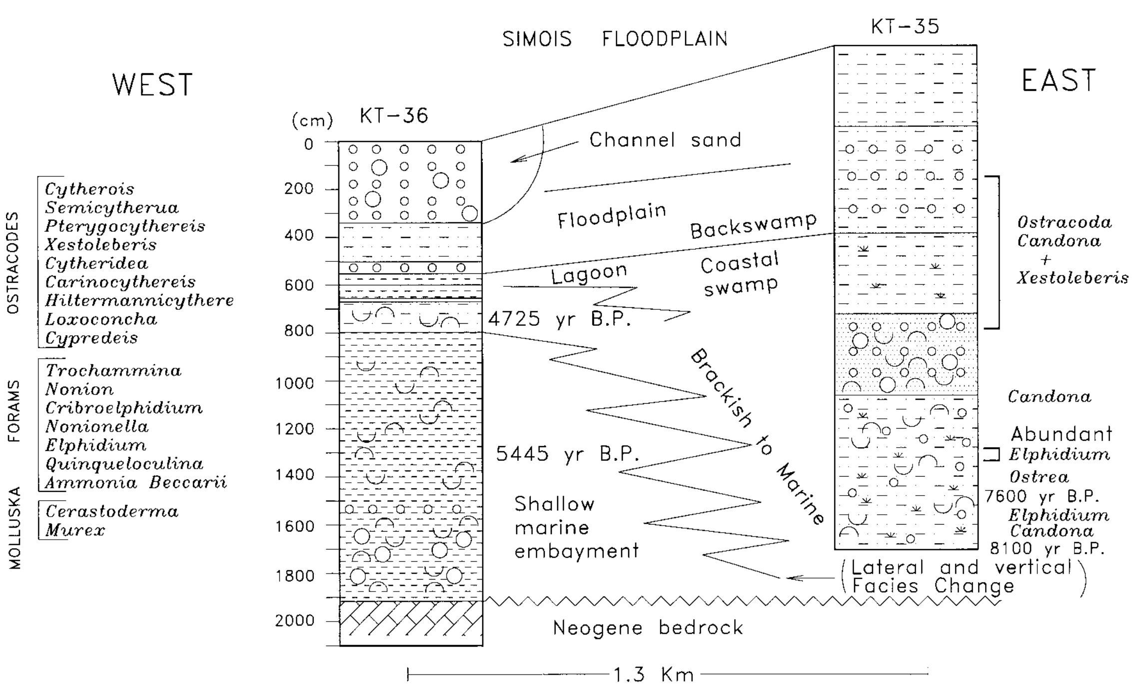

Figure 3. Facies diagram of Holocene marine transgression and later delta floodplain progradation into former Trojan embayment to northeast of Troy. Fossils listed from KT-36 were recovered from 11–17 m.

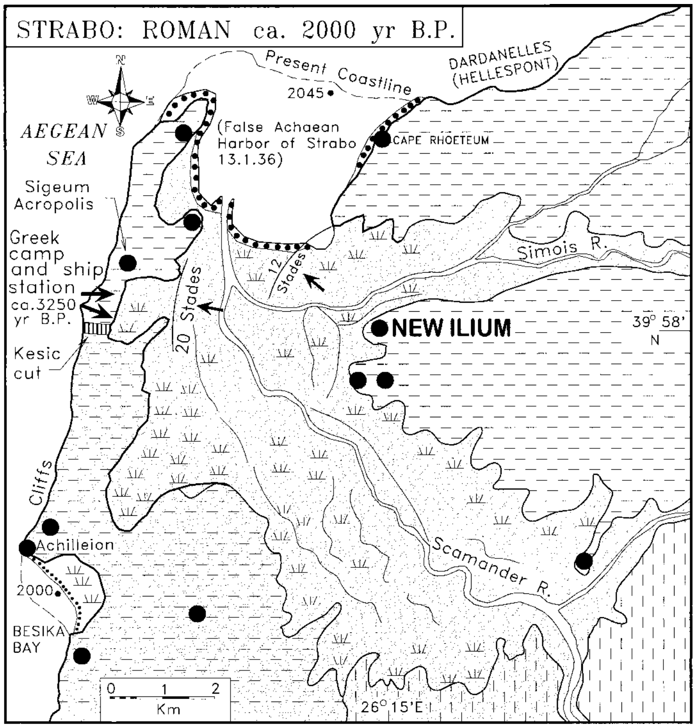

Figure 4. Environs of ancient Troy (New Ilium) in Strabo's time, showing 12 stades to "false" Achaean Harbor as perceived by inhabitants of New Ilium at that time vs. 20 stades to Homeric camp and ship station. For key to patterns, see Figure 1.

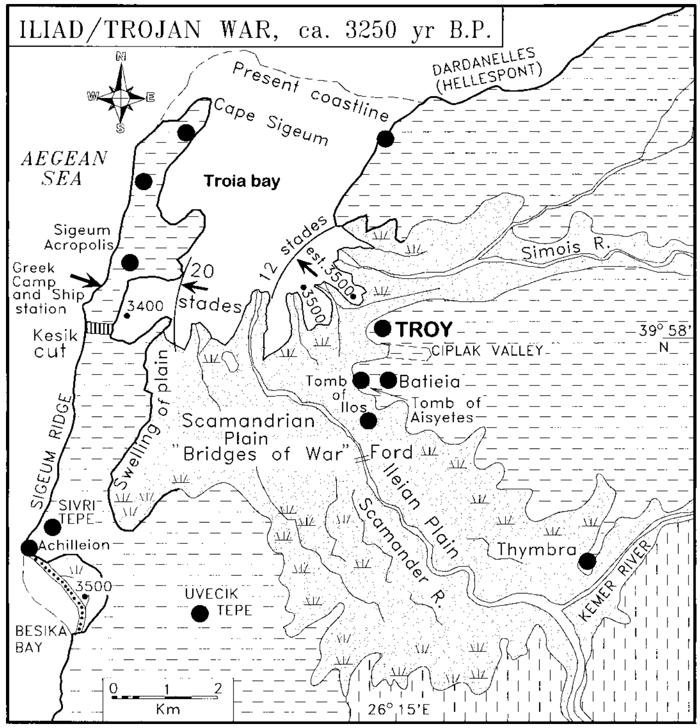

Figure 5. Paleogeographic features of Scamander plain and marine embayment at Troy in time of *Iliad*. Locations of morphology and historic features of *Iliad* are from Luce (1998). For key to patterns, see Figure 1.

was on the northwest shoreline of the Bay of Troy. An abundant edible shellfish supply was in the marine waters surrounding Kum Tepe, as well as Troy. To our own paleogeographic reconstructions we have added Homeric descriptions of sites and events described in the *Iliad* appropriately identified by Luce (1998) and by writers in antiquity. Although sedimentary environmental lithosome geometries cannot validate legend, we find nothing in the stratigraphic record that negates descriptions and events in the *Iliad*.

STRABO AND THE *ILIAD*

Critics have questioned Strabo's text with regard to Troy because it was secondhand. However, it was derived from two local authorities, Demetrios of Scepsis, who in turn relied on Lady Hestiaea of Alexandria Troas. As noted in Luce (1998, p. 132), ''She also raised questions about Homer's conception of the plain of Troy, pointing out that 'the plain now visible in front of the city,' was not then in existence, an insight for which she deserves much credit.''

Strabo 13.1.31: ''*The Simoeis and Scamander effect a confluence in the plain, and since they carry down a great quantity of silt they advance the coastline and create a blind mouth, and saltwater lagoons and marshes*''. . . and. . . Strabo 13.36: ''*The* <*Homeric*> *ship station is actually close to Sigeion, and the* <*main*> *mouth of the Scamander is also nearby, being 20 stades distant from Ilion, and if anyone says that the so-called ''Achaian's harbour'' is the ship station he will be speaking about a place that is too close* <*to Ilion*>, *since it is about 12 stades distant from the city, taking into account of the plain to the north of the city towards the sea, because this plain consists wholly of alluvium from the rivers, so that the distance is now [ca. 0 B.C.] 12 stades then [ca. 1250 B.C.] it would have been half that.*'' *(J.V. Luce)* [Note: numerics used for Strabo are a precise locator of book, page, and line in the Classics; see Strabo, 1960.]

Strabo (13.1.31) is quite specific about the Scamander and Simois confluence in the plain of Troy and the ''blind mouth and salt water lagoons and marshes.'' From this point alone, irregular quiescent em-

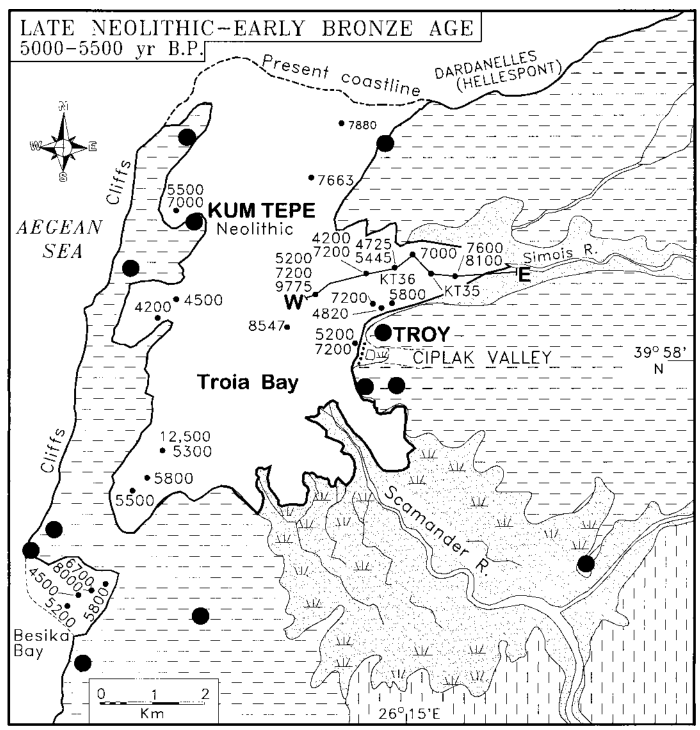

Figure 6. Late Neolithic–Early Bronze Age paleogeographic features at ancient Troy. Nearly all radiocarbon dates shown are from marine pelecypods that lived in shallow-marine muds and sandy muds. For key to patterns, see Figure 1.

bayment shorelines as shown in Figure 6 might be posited. However, Strabo's comments about distances may be of greater import. Note the 12 stades (2400 m) to the ''Achaians Harbour'' as thought of by the people of New Ilium (Troy) in 2000 yr B.P., and Strabo's note that the 12 stade distance would have been only half that, ~6 stades (~1200 m) at the time of the *Iliad*. Note Strabo's comment that the Homeric Greek ship station and camp were actually 20 stades (4000 m) from Ilium (Troy) and close to Sigeum (Figs. 4 and 5). Further, Strabo's ''distances'' to the shoreline and the Greek Camp and ship station are well supported by the environmental lithosome distributions and the radiocarbon dates.

Only a classicist can translate and interpret correctly the nuances of ancient Greek literature. Yet it takes a sedimentologist-geomorphologist to correlate the scholarship of the classicist with the geologic data and develop reasonably precise ancient landscapes.

IL.6.2 ''HITHER AND THITHER THE TIDE OF BATTLE SET STRAIGHT ACROSS THE PLAIN'': HOMER AND THE *ILIAD*

Our interpretation of the geographic features at the time of the Trojan War may be closely correlated with comments in the *Iliad*. We refer the reader to Luce, 1998, p. 111–163 for a detailed discussion of pertinent lines in the *Iliad*. We utilize standard Classics numerics as they allow the reader to refer to any of the many translations of the *Iliad* by book, page or line; however, we note that both nuances and substantive differences may occur (Fig. 5).

Disposition of the Trojans and Allies

Il.10, 427–431, The Greeks captured the Trojan spy Dolon, who says, ''*I will answer your questions truly and exactly. On the wings towards the sea are Carians, Paionians with their crooked bows, Leleges, Kaukones, and devine Pelasgians. On the wing towards Thymbra lie Lycians, proud Mysians, and Phrygian and Maeonian charioteers.*'' Il.2, 811–815, ''*Outside the town. . . there is a high mound . . . which men call Thorn Hill [Batieia]. . . It was here that the Trojans and their allies now formed up in battle order.*'' Thus the Trojan line of battle extended from the sea in front of Troy southeastward, covering the possibility that the Greeks would attack anywhere on the Scamander plain from the west-southwest.

The Greek camp and ship station were in clear site of each other. Il.10, 11–12 (regarding Agamemnon), ''*Whenever he looked toward the Trojan plain, he wondered at the many watch fires blazing before Ilios, at the sound of flutes and pipes, and at the murmuring from the host of men.*'' Il.14, 30–36, ''*The ships had been beached on the shore of the surging sea well away from the fighting. They dragged the first ones inland and built a wall at their sterns. For the beach, though broad, could not contain all the ships, and the force was cramped. So they ranged them in rows, and filled all the long mouth of the shore between the enclosing headlands.*'' In antiquity Aristarchus compared the rows of beached ships to ''seats in a theatre'' and ''rungs on a ladder.'' Note the embayment between the headlands as delineated by Luce (1998) based on Strabo's distance from Troy.

The Kesik cut, a great wall and ditch (Kayan, 1995), was proposed by Nestor: Il.7, 336–343, ''*And let us build near it a lofty fortification as a protection for the ships and ourselves . . . not far away, let us dig a deep ditch to hold back horses and fighting men so that the stout Trojan battle line may not overwhelm us.*'' Il.12, 50–54, ''*When the Trojans attack the next day, Hector's horses are brought up short on the edge of the ditch and stand whinnying in fear, unable to jump it or pass through it.*'' Il.16, 370–377, ''*For many a team of swift horses snapped their poles at the head of the shaft and left charioteer and chariot behind.*''

The battle at the Scamander: Il.20, 1–3, The Trojans are ''*on the swelling of the plain*'' close to ''*the beaked ships*'' when Achilles drives them back to the Scamander. Il.21, 1–11, ''*But when they came to the ford of the fair-flowing river Xanthos* (Scamander) . . . *Achilles broke the Trojan line and sent half of the enemy flying in rout across the plain towards Troy. . . But the remainder were pinned back against the deep stream with its silver eddies. In they tumbled with loud splashes, and the din resounded from the depths of the pools and from the banks on the other side. With piteous cries they swam here and there, whirled round by the current.*'' Il.21, 25–26, Trojans ''*cowered below the overhang.*'' Such a vivid description of a deep river with cut banks and strong currents can only fit the middle and upper stretches of the Scamander plain before Troy.

CONCLUSIONS

This paper presents our current understanding of the lower Scamander floodplain and coastal environments over the past six millennia. The synergy among the written word, the archaeological record, and the sedimentologic and paleontologic data clearly leads to an interpretation superior to the findings of the separate disciplines. We have demonstrated that geologic, geomorphic, and fossil evidence can be correlated with the ancient literature for a more complete understanding of the places and events of the *Iliad*. Additional drill-core data, ^{14}C dates, and new geophysical techniques may vastly improve our models, but perhaps not invalidate them. The reality of Homer's description of place, event, and topography correlated with geologic investigation helps show that the *Iliad* is not just a legend, but regularly consistent with paleogeographic reconstructions.

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