Consumption of fish in the Late Bronze and Iron Ages at Tel Hazor, Israel

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Abstract
Fish consumption played a significant role in the diet of ancient communities in the southern Levant during the second and first millennia BCE, reflecting not only subsistence strategies but also aspects of social identity and economic interaction. Although Hazor—one of the largest and most influential urban centers of the region—was situated close to abundant freshwater sources, its ichthyoarchaeological record has remained largely unstudied. Here we present the first comprehensive analysis of more than 2,000 fish bones recovered from diverse contexts at the site, including the Late Bronze Age (LBA) administrative palace and lower city, Iron I pits, and Iron II administrative buildings, workshops, and domestic structures. By comparing taxonomic composition, fish size, and preparation methods across these contexts, we show continuity between the LBA and Iron Age, as well as synchronic similarities between socially distinct areas of the site. Two outstanding patterns at Hazor are preference for local (non-marine or imported) fish and for small fish. Our results indicate that, in contrast to patterns observed at other contemporary sites in the southern Levant, fish cuisine at Hazor was not employed as a marker of elite status. Both elite and non-elite contexts yielded similar ranges of species and comparable size profiles. Moreover, the consistent evidence of the same preparation technique—particularly the crushing of catfish skulls—across all periods and social contexts, suggests a remarkable continuity in culinary traditions. These findings challenge assumptions about the role of exotic or nonlocal fish in elite display and point, instead, to a shared culinary identity that endured through significant political, social, and demographic transformations from the LBA to the Iron Age.

1. Introduction
Ancient societies have relied on fishing as an important economic activity, as is evident by the fish remains found at numerous archaeological sites around the world including the southern Levant, such as Jerusalem and Ashkelon (Van Neer et al., 2005). Fish bones are a unique proxy for examining economic relationships and components at both coastal and inland sites, and their examination can also reveal aspects of food consumption and behavior.

Tel Hazor is located in the Upper Galilee, Israel. It was situated near the southwestern shores of the ancient Hula Lake, in a wetland area that was drained in the 20th century CE. However, in the Bronze and Iron Ages, the inhabitants of Hazor enjoyed the advantages of the lake—specifically, the ease of fishing in this freshwater source.

This paper aims to examine changes and continuities in the consumption of fish between the Late Bronze Age (LBA, 1550–1250 BCE) and Iron Age (1000–732 BCE) at Hazor. Based on Hazor's changing status—from the largest and most important Canaanite urban center during the LBA to a typical Israelite center in the Iron Age—we expected to find differences in the fish assemblages and consumption behavior. Specifically, we hypothesized that LBA inhabitants had more access to and desire for nonlocal fish, using them to display higher status during feasts.

We also explore the possibility that social and political changes correlated with the methods of acquiring and consuming fish during this time frame. These changes could be reflected in the archaeological record through shifts in diet, procurement of fish, and possibly also the preparation of fish cuisine, as has been suggested for mammal consumption at Hazor in the LBA (Marom and Zuckerman, 2012). This may shed light on different economic strategies of the inhabitants of the site, as well as the human-environment relations in the LBA and Iron Age. One of the advantages of our study is that the material was obtained from both the acropolis (LBA and Iron Age contexts) and the lower city (only LBA contexts) at the site, allowing us to conduct diachronic and synchronic studies and to examine contemporary contexts that are socially different. We expected the LBA acropolis assemblage to reflect elite consumption, with greater species diversity, larger and higher-quality fish, and more elaborate preparation methods, consistent with status-display feasting. In contrast, the LBA lower city and the Iron Age assemblages were expected to contain more local species of smaller size, consistent with everyday household consumption (Table 1).

2. Historical and archaeological context

Tel Hazor is located near the southwestern shores of the ancient Hula Lake, about 15 km north of the Sea of Galilee and 6 km west of the Jordan River (Fig. 1). Studies of LBA and Iron Age architecture at the site indicate that, following the city's destruction in the mid-13th century BCE (Bechar et al., 2021), several centuries passed before Hazor reemerged as an administrative center—likely by the 9th century BCE, though possibly as early as the late 10th century BCE (Ben-Ami and Ben-Tor, 2012).

Iron Age Hazor is generally regarded as an Israelite center (Ben-Tor, 2015), though some scholars propose that it was an Aramean city during some of this period (e.g., Finkelstein, 1999; Kleiman, 2022). Without delving into this debate, it is clear that the Iron Age city differed significantly from its Canaanite predecessor in various aspects, such as the size of the site (84 ha vs. 10 ha), the character of the acropolis (only public buildings in the LBA vs. public and private buildings, as well as workshops, in the Iron Age), and cultic behavior (temples and metal statues and figurines in the LBA vs. standing stones and ceramic figurines in the Iron Age). These differences have convinced scholars that the Iron Age inhabitants of Hazor were different socially and possibly culturally from those of the LBA (e.g., Ben-Tor, 2015). Thus, we would expect to identify differences in the preparation techniques and consumption of fish.

The site was first excavated by Yigael Yadin in the mid-20th century CE. Excavations were renewed by Amnon Ben-Tor in 1990. One of the goals of the renewed excavations at Hazor was to retrieve a detailed dataset on human-environment interactions and on human foodways, aspects that have not been addressed by Yadin's

Table 1. Expectations of findings, based on different contexts and periods.

Date	Context	Expectation
LBA	Acropolis, administrative palace	* Species diversity, higher-quality fish * Large fish * Elaborate preparation
LBA	Lower city, domestic	* Mainly local species * Small fish
Iron Age	Acropolis, domestic, and industrial	* Mainly local species * Small fish

Figure 1. Southern Levantine sites mentioned in the article.

excavations.[1] By applying wet-sieving (see below), an assemblage of thousands of fish remains was retrieved. This study examines changes and continuities in foodways and human-environment interactions between the LBA and Iron Age settlements at Hazor through the analysis of fish remains.

3. Tel Hazor

The city of Hazor was first established around the 19th century BCE, in the Middle Bronze IIA, first its acropolis and then its lower city (Fig. 2; Bechar and Yasur-Landau, forthcoming). The acropolis featured large royal and cultic structures during the Middle Bronze Age and LBA. Notably, numerous Egyptian statues were discovered in the ceremonial precinct—a royal LBA temple—and in the administrative palace, also dated to the LBA. These finds suggest that the kings of Hazor received prestigious and luxurious gifts from their Egyptian counterparts (Connor et al., 2017:584).

The lower city contained both monumental structures, such as temples and gates, and domestic and commercial units, including houses, workshops, and possibly market areas. Recent research suggests that parts of the lower city were uninhabited during the LBA, indicating a reduction in the city's occupied area (Shalvi and Bechar, 2025). In the mid-13th century BCE, both the acropolis and lower city were destroyed in a large conflagration. The lower city was briefly resettled before its final abandonment (Bechar et al., 2021).

After a hiatus of over a century, a small settlement emerged on the acropolis during the Iron I. This phase was characterized primarily by pits and two cultic installations. The urban nature of Hazor was reestablished in the Iron IIA,[2] with the construction of fortifications, administrative buildings, and domestic structures in the western part of the acropolis. Near the city gate, a complex of large standing stones was constructed in association with the ruins of the LBA city (Bechar, 2018). In the late Iron IIA, the city expanded eastward, with numerous storage facilities built. During the Iron IIB, many public buildings were repurposed as workshops and domestic units, though Hazor remained an important Israelite center. The city was ultimately destroyed in 732 BCE, during Tiglath-Pileser III's military campaign against the northern Israelite kingdom. Following this destruction, Hazor never regained its status as a significant urban center.

4. Materials and methods

The fish remains discussed in this paper were found in both LBA and Iron Age contexts (Fig. 2, Supplementary

[1] This was part of a project named "Hazor Fish and Chips," headed by one of the authors (S.B.), conducted between 2009 and 2019. It was funded by the Stevan B. Dana Archaeology Project Fund and includes collaborations with Nimrod Marom, Miriam Belmaker, Sonia Pinsky, and Andrea Orendi.

[2] No absolute dates are mentioned throughout the article, due to the ongoing debate regarding the chronology of Hazor in the Iron Age (e.g., Finkelstein, 1999; Ben-Tor, 2001; Shochat and Gilboa, 2018). We therefore refer to relative dates, apart from the date of the end of Iron Age Hazor, 732 BCE, which is agreed on by all scholars.

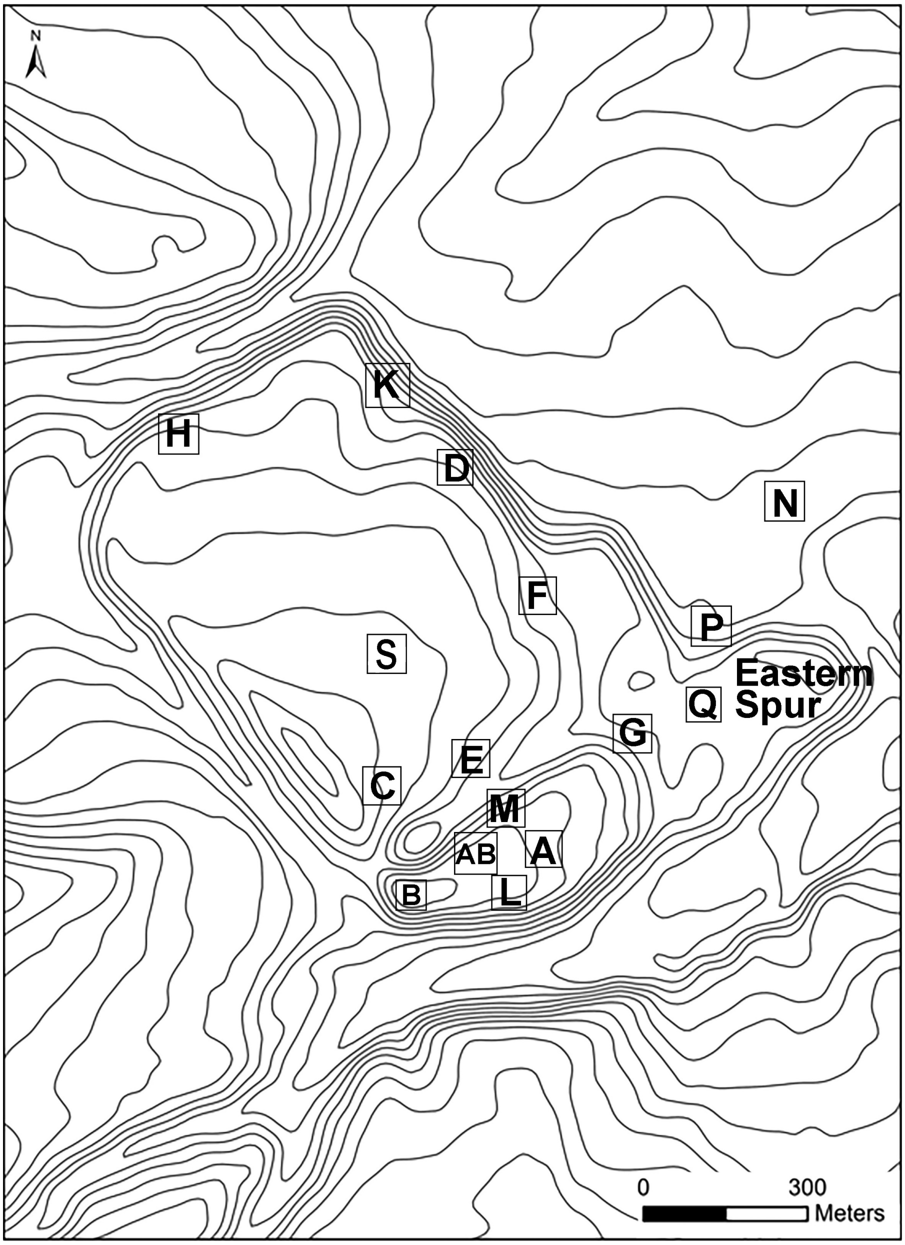

Figure 2. Map of Tel Hazor and the mentioned excavation areas.

Material 1). Fish remains from the LBA were retrieved from two primary contexts:

1) Area S in the lower city: All fish remains from this area were found in domestic contexts and dated to the LBA destruction level of Stratum 1b, which is contemporary with the LBA remains from the acropolis (see below).
2) Area M in the acropolis: Fish remains were found in the destruction level of the administrative palace, dated to Strata XIV–XIII (Bechar, forthcoming), contemporary with Stratum 1b of the lower city (Bechar et al., 2021). Fish remains were retrieved either above the floors of the palace or from installations located at the entrance to the palace halls.

Fish remains from the Iron Age were found in a variety of contexts:

1) Iron I: mainly in two small installations built over the destruction level of the LBA administrative palace;
2) early Iron IIA: in installations or within the complex of large standing stones;
3) late Iron IIA: outside large storage buildings, where the fill was notably saturated with a significant quantity of mammal bones;

4) Iron IIB: in several distinct locations — the large plaza, on floors of domestic and industrial structures built above the earlier storage buildings, and in the destruction and abandonment levels of the end of the 8th century BCE.

Three different techniques for collecting fish bones were utilized at Hazor.

The first recovery method, applied throughout the entire excavation area, involved the unsystematic hand collection of all recognizable animal bones, including fish remains, in the field.

The second method was implemented for contexts with a high probability of yielding small cultural materials, such as destruction layers, building floors, and refuse pits. Soil samples were randomly collected (one out of five-ten soil buckets) from these contexts. These were wet-sieved, and fish bones were subsequently picked from the residue.

A third method was applied to the floors of two rooms in the lower city (Area S, Stratum 1b, dated to the LBA IIA) and one room on the acropolis (Area M, Stratum VI, dated to the Iron IIB). These floors were divided into 50 × 50 cm squares, and fish remains were retrieved from 5 cm thick stratigraphic layers. Soil samples from these contexts were wet-sieved, and the fish bones, picked from the residue. As expected, this third, most systematic, method yielded the largest recovered assemblages of fish bones. These fish bones were then analyzed by one of the authors (O.L.).

Specimens were identified to the lowest taxon possible by comparison with O.L.'s private comparative reference collection. For each specimen identified, a record was made of the element represented, its symmetry (right or left), and evidence of modification (burnt or cut). Measurements of specimens were taken according to Morales and Rosenlund (1979), and estimates of fish size (standard body length in cm) were determined using allometric calculations obtained from the literature (Desse et al., 1987; Van Neer, 1989; Desse and Desse-Berset, 1996) and some generated from O.L.'s reference collection.

Quantification of the fish remains included a count of the total number of identified specimens for each taxon (NISP) and calculated estimates of the minimum number of individual fish represented (MNI). The MNI figures were determined separately for each locus or group of loci and were based on the concept of paired elements and individual size.

5. Results

Of the entire assemblage of 2,018 bones, 1,465 specimens (73%) could be identified as belonging to 42 different skeletal elements of fish (Supplementary Material 1). The remaining 553 specimens were mostly fragments of spines or other bony projections. The identified elements include 633 vertebrae, 217 face bones (branchiocranium), 163 fin spines and pterygiophores, 446 bones of the neurocranium, and a few other skeletal elements. Twenty-three percent of the fish bones showed evidence of burning. Of these, some were recovered from the LBA destruction level—48% (NISP = 223 of all bones, including unidentified bones). Others were found within installations, possibly areas where waste was intentionally burnt—2% in LBA installations (NISP = 8 of all bones) and 9% in those of the Iron Age (NISP = 43 of all bones). Seventeen percent were found in the Iron IIB abandonment level (NISP = 82 of all bones, including unidentified bones), and 5% were found in Iron IIB post-abandonment levels (NISP = 24 of all bones). The remaining 19% of the burnt fish bones (NISP = 89 of all bones) were not associated with contexts that clearly indicate burning-related activities.

5.1 Taxonomic composition

Taxonomic identification was achieved for 940 bones (Table 1), accounting for 47% of the entire assemblage and 64% of all identified skeletal elements (Supplementary Material 1). The Iron I fish assemblage is too small to provide valuable insights, and thus we discuss and compare only the LBA and Iron II assemblages.

5.1.1. Local freshwater fish

Bones of local freshwater fish constitute 93.4% of all identified bones at Hazor, including catfish, carps, and cichlids.

Catfish: The most common identified fish at Hazor was the local catfish, *Clarias gariepinus* (Burchell, 1822), commonly known as the Nile catfish, comprising 61.8% of all identified bones (156 bones and 424 skull fragments; MNI = 93; Table 2, Fig. 3:1–4). Catfish bones comprise 65% of the identified bones found in the LBA

Table 2. NISP counts of freshwater and marine fish from Hazor, according to periods and taxa (families).

Family	LBA	Iron I	Iron II	Total
Freshwater fish				
Clariidae (catfish)	307	10	263	580
Cyprinidae (carps)	62	2	104	168
Cichlidae (cichlids)	30	1	93	124
Centropomidae (Nile Perch)	1		2	3
Total	**400**	**14**	**462**	**875**
Marine fish				
Sparidae (porgies)	15		29	44
Mugilidae (mullets)	1		8	9
Sciaenidae (drums)	3		2	5
Serranidae (groupers)	1	1	2	4
Moronidae (sea basses)			1	1
Sharks	1			1
Carangidae (jacks)			1	1
	21	**1**	**43**	**65**
All identified	**421**	**16**	**505**	**940**
Unidentified	474	24	582	**1,080**
Grand Total	**895**	**38**	**1,087**	**2,020**

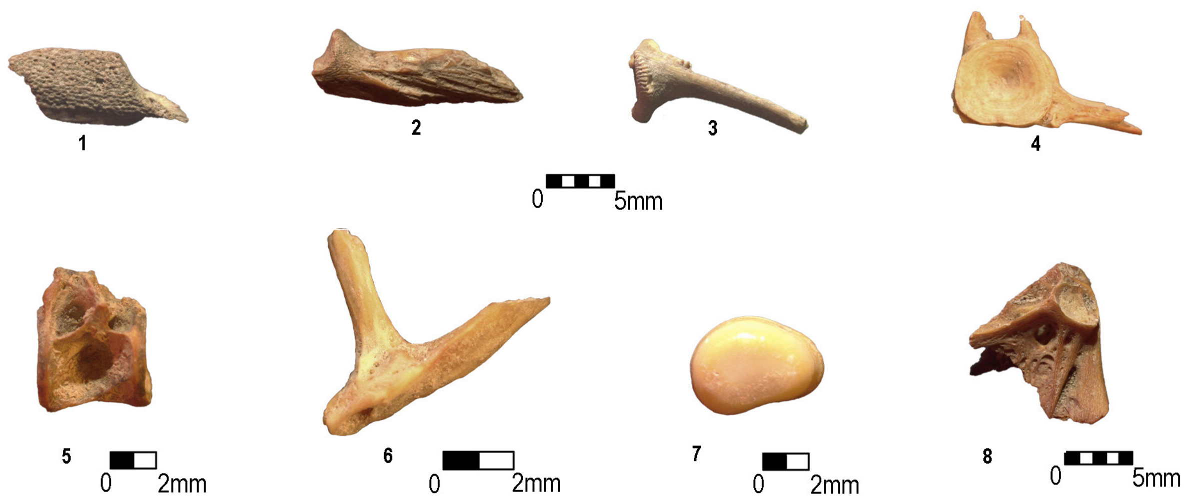

Figure 3. Fish bones of different species mentioned in the article: (1) fragment of a right dentary of *C. gariepinus*, alveolar view; (2) well-preserved left articular bone of *C. gariepinus*, medial view; (3) fragment of a right pelvic spine of *C. gariepinus*; (4) anterior vertebra of *C. gariepinus*, anterior view; (5) anterior vertebra of a fish of the family Cyprinidae, left lateral view; (6) left posttemporal bone of a fish of the family Cichlidae; (7) kidney-shaped posterior molar tooth of *Sparus aurata* (Linaeus 1758) family Sparidae; (8) left operculum of *Mugil cephalus* family Mugilidae, medial view.

palace (NISP = 156), 84% of the identified bones found in the LBA lower city (NISP = 151), 55% of the identified bones found in various Iron IIA contexts (NISP = 36), and 52% of the identified bones found in various Iron IIB contexts (NISP = 227).

This species is the largest freshwater fish in Israel today, capable of reaching a maximum length of 150 cm and a weight of up to 20 kg. It inhabits primarily lakes, large sluggish rivers, slow-moving streams, and swamps. The Nile catfish is native to the Nile and most river systems of North Africa (Boulenger, 1907), from which it spread in antiquity, throughout the Levant, as far north as northern Syria. In Israel it is found in coastal rivers and within the Jordan River system, including the Hula Lake and the Sea of Galilee (Goren, 1983).

A distinctive feature of the Clariidae family is a primitive air-breathing organ, encased along with the brain in a robust neurocranial box that comprises approximately one third of the fish's body. This organ enables the catfish to survive in water with low oxygen levels or partial seasonal drying up. The species is also capable of traversing short distances over land between stagnant pools of water, using its strong pectoral spines. The Nile catfish is an omnivorous feeder, consuming a wide range of organic matter, including small fish, amphibians, reptiles, birds, small mammals, snails, crustaceans, and plant material, such as seeds and fruits.

Catfish are commonly caught using rods and hooks or nets. Fishermen are known to discard the large, bony heads of catfish, which have minimal nutritional value, at the fishing site, a practice referred to in archaeozoology as the "schlepp effect" (Daly, 1969). As a result, archaeological assemblages at various sites in Israel often contain vertebrae and pelvic spines but lack cranial elements. However, this pattern was not observed in the assemblage from Hazor, where remains include both vertebrae and a variety of cranial elements, including 424 small skull fragments (Fig. 4). Notably, these were distributed across 59 out of 97 loci (61%) within all excavation areas, making their widespread presence a unique phenomenon. The significance of this pattern is explored in the discussion below.

Cyprinidae (carps): The second most common family of fish in this assemblage is the Cyprinidae, comprising 17.9% of all identified bones (167 bones; MNI = 77; Table 2, Fig. 3:5). Carp bones constitute 20% of the identified bones found in the LBA palace (NISP = 47), 8% of the identified bones found in the LBA lower city (NISP = 15), 18% of the identified bones found in various Iron IIA contexts (NISP = 12), and 21% of the identified bones found in various Iron IIB contexts (NISP = 92).

Figure 4. Neurocranial fragment of C. *gariepinus*; natural edge ("suture" with adjacent bone) marked with "x": (1) outer surface; (2) inner surface.

Cyprinids are abundant in the Sea of Galilee and dominate the Jordan River system, as well as freshwater systems in Africa (Krupp, 1987). Identifying cyprinid remains to the species level is particularly challenging (Lepiksaar et al., 1977); however, the assemblage includes several lower pharyngeal bones, which are diagnostic elements for species-level identification in this family. These remains were attributed to three species within the carp family: the Longhead barbel *Luciobarbus longiceps* (Valenciennes, 1842), the Large-scale Barbel *Carasobarbus canis* (Valenciennes, 1842), and the Damascus barbel *Capoeta damascina* (Valenciennes, 1842).

Cichlidae (cichlids): Bones of this family comprise 13.3% of all bones (124 bones; MNI = 47; Table 2, Fig. 3:6). They constitute 12% of the identified bones found in the LBA palace (NISP = 28), 1% of the identified bones found in the LBA lower city (NISP = 2), 15% of the identified bones found in various Iron IIA contexts (NISP = 10), and 19% of the identified bones found in various Iron IIB contexts (NISP = 83).

This family comprises approximately 600 tropical species of small to medium-sized fish, exhibiting a wide range of morphological adaptations. In Israel seven cichlid species are present, four of which are large enough to have nutritional and commercial value (Goren, 1983). These species inhabit the Jordan River system, including the lakes, as well as coastal river systems. Cichlids display complex breeding behaviors, characterized by territoriality and nesting. They are particularly notable for their unique reproductive strategy of mouthbreeding, in which fertilized eggs—and, in some cases, juvenile fish—are sheltered within the parent's mouth.

5.1.2. *Nonlocal fish (marine and Nilotic fish)*

Marine and Nilotic fish, probably transported to Hazor from the Mediterranean Sea, approximately 60 km to the west, constituted only 7% of the identified bones. Despite the limited number of bones recovered (65 bones; MNI = 46; Table 2, Fig. 3:7–8), the taxonomic diversity was notable, comprising seven families and at least nine species. The bones of marine fish comprise 3% of the identified bones found in the LBA palace (NISP = 8), 7% of the identified bones found in the LBA lower city (NISP = 13), 9% of the identified bones found in various Iron IIA contexts (NISP = 6), and 8% of the identified bones found in various Iron IIB contexts (NISP = 37).

Imported Nile perch (*Lates niloticus* [Linnaeus, 1758]) remains—three bones representing three individuals (Table 2)—were recovered from three distinct contexts in the acropolis: the LBA palace, an early Iron IIA installation, and a large courtyard attributed to Iron IIB (one bone in each context).

At most southern Levantine sites where fish bones were identified, there is a clear preference for marine fish, brought from the Mediterranean Sea (see below). However, at Hazor only 65 bones of nonlocal species (Marine and Nilotic fish) were identified, comprising 7% of the entire identified fish bone assemblage (Table 2).

Interestingly, the diversity of fish taxa remains largely consistent between the lower city and the administrative palace, both dated to the LBA (33 contexts), as far as local vs. nonlocal fish are concerned (Fig. 5). Comparison of the local fish groups (Clariidae, Cichlidae, Cyprinidae) with all nonlocal fish showed a significant difference between the samples from the lower city and the acropolis (Fig. 5; $\chi2 = 31.13$, $p < 0.001$). There is a higher proportion of catfish in the lower city and more carps in the administrative palace. Nonlocal species are similarly (rarely) represented. Thus, though there may be differences in preferences for local fish, it seems that nonlocal fish were rarely obtained in both assemblages. These data may suggest that the consumption of nonlocal fish was not a significant social marker at Hazor during the LBA.

5.2. Size estimations of the fish

Fish size has significant implications for both fishing techniques and consumption preferences. Fish exhibit indeterminate growth, and continue to grow throughout their lifespan, unlike mammals and birds, which cease growth upon reaching adulthood. While a fish's growth rate may slow with age, it never fully stops growing, provided that environmental conditions—such as food availability, water quality, and temperature—remain

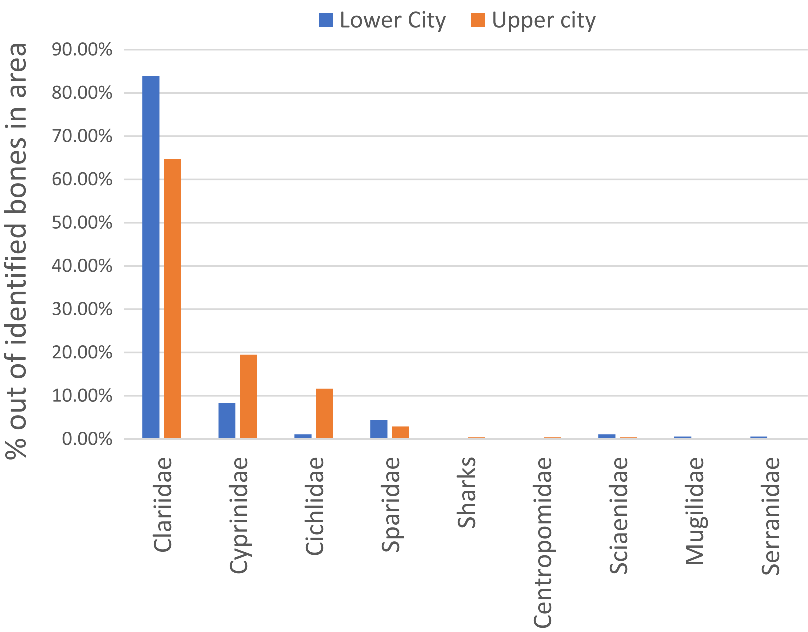

Figure 5. Variety of fish in LBA contexts: lower city vs. acropolis.

favorable. Consequently, older fish tend to be larger, influencing ecosystem dynamics and fishing practices.

A total of 269 well-preserved bones permitted measurements and size estimations of the fish (Supplementary Material 1). A comparison between the LBA and Iron II reveals similar size distributions of cichlids, carps, and catfish (Figs. 6–8). Fishermen in Lake Hula providing these fish to Hazor consistently targeted for small fish compared to the same kinds found at other sites (Figs. 6–7), including Lachish (Lernau and Golani, 2004) and Shiqmona (based on unpublished data).

Comparing the sizes of Mediterranean and Nilotic fish found at Hazor with those at other sites again shows much larger fish sizes in the latter (Fig. 9; based on data from Tel Rehov [Lernau, 2020], Miqne-Ekron [Lernau, 2017], and Lachish [Lernau and Golani, 2004] and

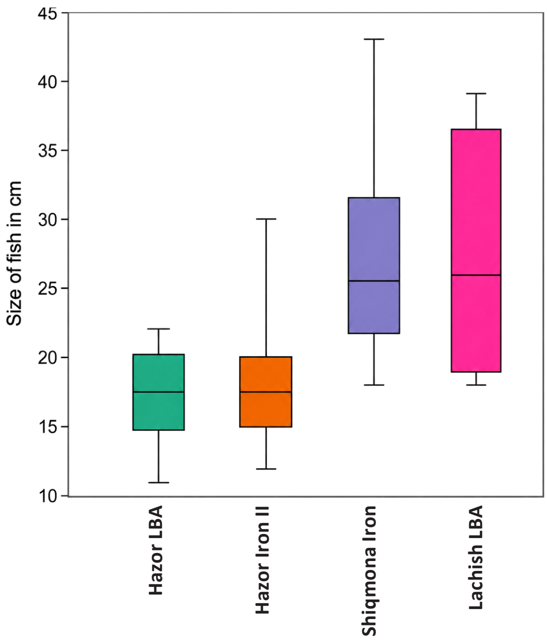

Figure 6. Size distribution of Cichlids at Hazor during the LBA and Iron II, at Shiqmona in the Iron Age, and at Lachish in the LBA.

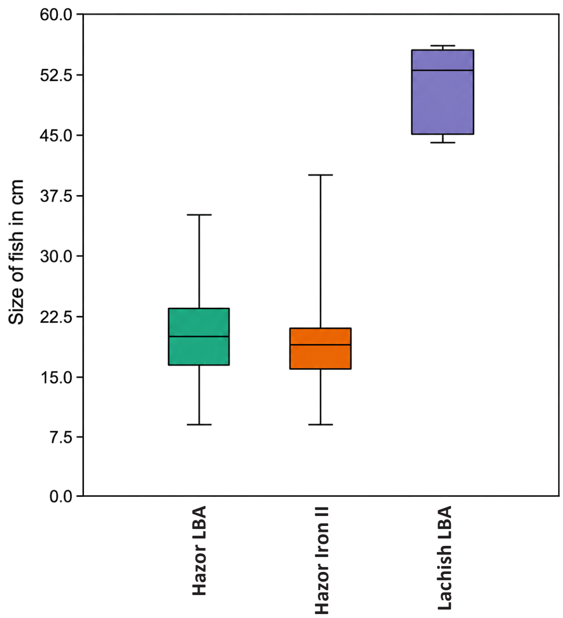

Figure 7. Size distribution of carps at Hazor in the LBA and Iron II and at Lachish in the LBA.

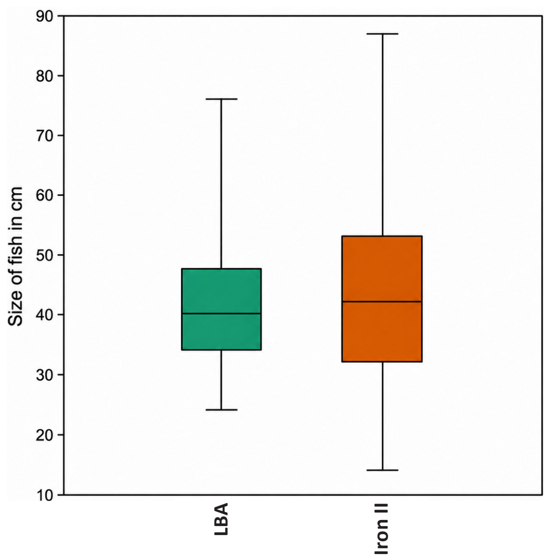

Figure 8. Size distribution of catfish at Hazor in the LBA and Iron II.

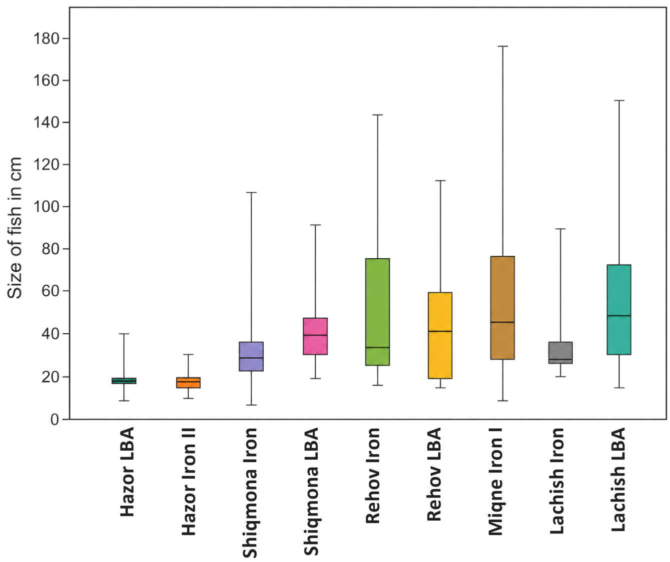

Figure 9. Size distribution of marine and imported fish from Hazor, Shiqmona, Rehov, Miqne, and Lachish in the LBA and Iron Age.

unpublished material from Shiqmona). Interestingly, significant preference for small fish is found at Hazor during both periods, for local and nonlocal fish. Since the sizes of freshwater fish at other sites are considerably different from those at Hazor, it can be assumed that, although the technology to fish large fish was available to the city's inhabitants, they chose smaller fish. Consequently, we may conclude the following:

1) Fishing techniques remained constant across both the LBA and Iron Age. Carps and cichlids were likely caught using nets with small holes, while catfish may have been captured by using fishing rods and hooks.
2) Consumption preferences for small fish did not change significantly between the two periods, suggesting continuity in dietary habits.
3) The population of Hazor expressed a culinary preference for smaller fish, whether local freshwater species or nonlocal marine and Nilotic fish—a distinctive feature of the Hazor assemblage. The reduced size may reflect localized traditions related to fish preparation and consumption practices.
4) Such patterns highlight both technological continuity in fishing methods and stable dietary preferences at Hazor throughout the LBA and Iron Age.

5.3 Crushed catfish skulls

Unique finds among the fish remains at Hazor are 417 crushed catfish skull fragments (Supplementary Material 1). Skulls are composed of multiple bones connected along sutures. In mammals, these bonds are strong and usually keep the skull bones attached for extended periods postmortem. In fish, however, the sutures are weaker, causing the bones to separate more readily either by cooking or in postdepositional processes. As a result, excavated fish skull bones are usually found disarticulated with intact sutures along their sides. This is also the case for catfish skulls. Traumatic fractures of catfish skull bones, on the other hand, usually propagate along preexisting structural weaknesses parallel to lines of small projections on the outer surface of the skull.

Of the skull fragments, 235 were found in 25 different LBA loci, 7 in an Iron I locus, and 175 in 32 Iron II loci. The fragments were distributed across the excavated areas in groups ranging from 1 to 100 pieces, with 148 of them showing signs of burning. Their general shape was of irregular polygons, typically triangular, quadrangular, or pentagonal, though some had up to eight sides. The fragments are small, with a mean measurement across the largest axis of 10.2 mm in the LBA and 11.7 mm in the Iron II, with a range of 3.0–28.0 mm (Fig. 4). The size distributions of the fragments (Fig. 10) in the LBA and Iron Age are practically identical. The large number of skull fragments, their small size, and their distribution across the entire excavated areas precludes the possibility that they were formed by postdepositional breakage resulting from pressure, trampling, etc.

Fractured catfish skull fragments are created by forceful crushing of the robust brain case. In an experiment

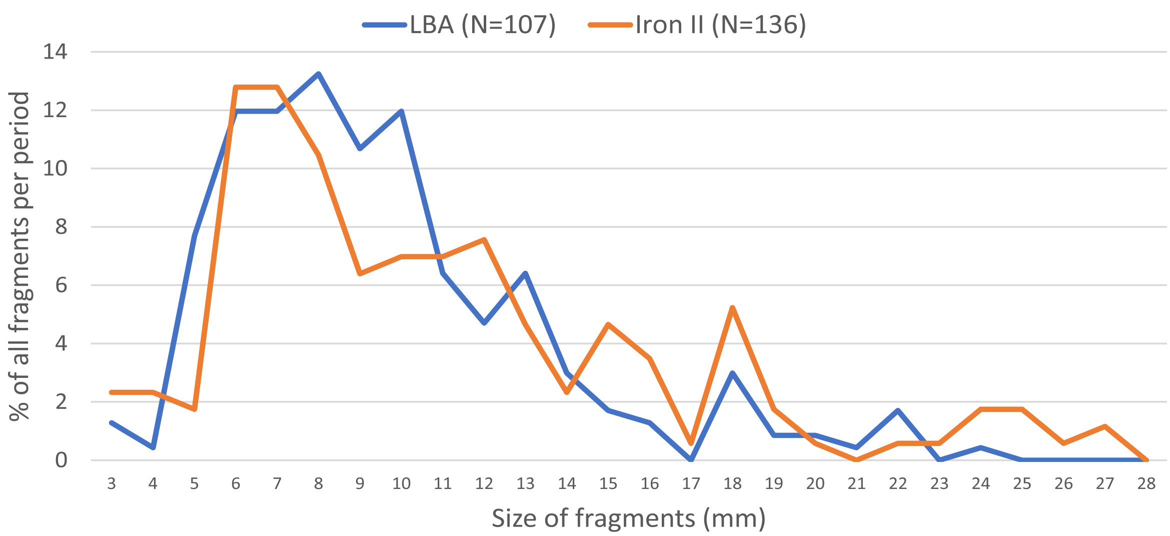

Figure 10. Size distribution of catfish skull fragments by periods.

we conducted, we hammered the skulls of two modern catfish (measuring about 40 cm) using a wooden rolling pin, in order to examine the energy required to produce the fragments. The fragments formed were of similar shapes yet larger than the excavated ones. Thus, it seems that the original process may have involved applying increased force or utilizing smaller tools, such as hammering implements that concentrate impact on a smaller surface area, thereby producing finer fragments.

Close examination of the excavated fragments allows differentiation between naturally disarticulated sutures and traumatic fractures. Figure 11 shows the numbers of traumatic fractured edges of polygons with three, four, and five sides, in the LBA and Iron Age. The chart shows that the vast majority of sides of fragments are traumatic in origin (i.e., not naturally disarticulated) and that the pattern of the distribution of traumatic sides of the fragments is similar in both periods.

The following is a summary of the observations emerging from the analysis of the skull fragments:

1) Most skull fragments are very small. Had the fractures been the result of postdepositional breakage, we would have expected them to be inconsistent in size.
2) The vast majority of the fragments' sides are broken rather than naturally separated at the sutures.
3) There is a striking similarity between the LBA and Iron II in both size distributions and the relative proportions of breakage vs. suture separation. Had these fragments been a result of postdepositional breakage (trampling, sediment pressure, etc.), we would have expected differences in distribution and proportions to be reflected in different contexts.
4) These data suggest intentional fragmentation of catfish skulls employing considerable force.
5) Treatment of catfish skulls by crushing was widespread across Hazor, both in the lower city and the acropolis, and during both the LBA and Iron Age.

6. Discussion

The fish bone analysis from Hazor reveals several distinct differences and similarities across various periods and contexts, notably between the acropolis and the lower city and between the LBA and Iron Age, as well as within the Iron Age (Iron IIB and earlier phases). Below, we will address both the differences and continuities observed.

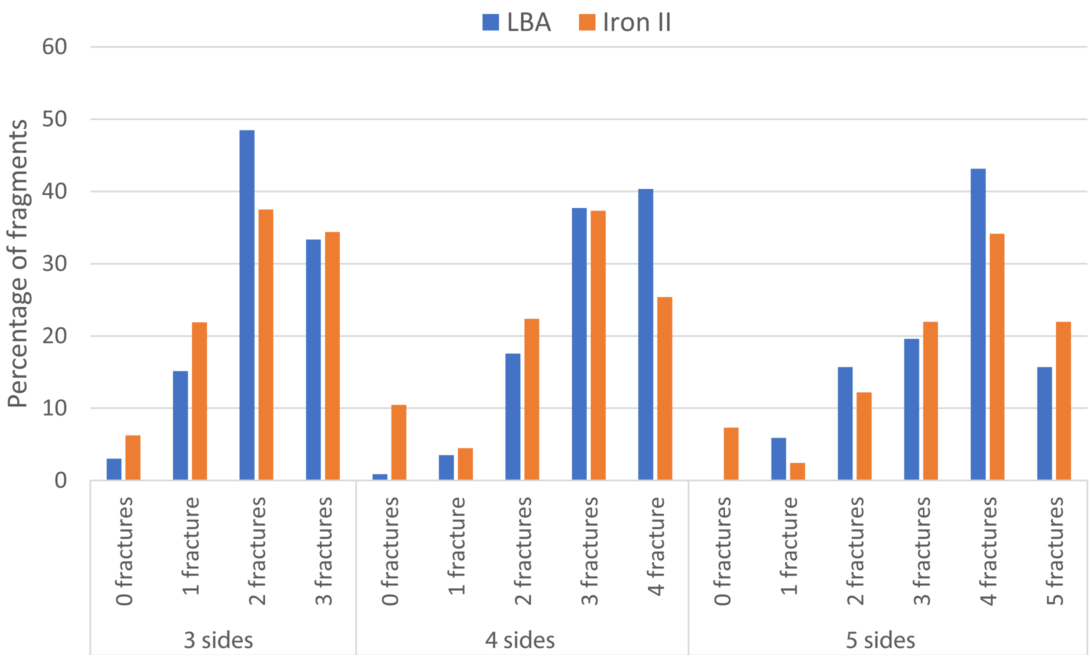

Figure 11. Sutures vs. traumatic fractures in catfish skulls.

6.1 The fish assemblage from Hazor vs. contemporaneous assemblages

Nonlocal fish brought to Hazor from the coast comprise less than 8% of all identified bones (5% in the LBA and 7.5% in the Iron Age). This small percentage of marine and imported fish contrasts sharply with assemblages from other contemporaneous sites in the southern Levant, where excavated bones belong primarily to marine and Nilotic species. These include, for example, the LBA assemblages from Lachish, with 94% comprising Mediterranean and Nilotic fish (Lernau and Golani, 2004); the Iron II assemblages from Jerusalem, with 94% marine and Nilotic fish (Lernau et al., 2008); and the LBA and Iron Age assemblages from Tel Rehov, with 90% nonlocal fish (Lernau, 2020). It should be noted that Tel Rehov is located near the Jordan River, and, thus, though its inhabitants would have been able to acquire local fish from this freshwater source, they chose to consume mainly nonlocal fish.

6.2. Nile perch, Egypt, and the southern Levant

During the LBA and Iron Age, Egypt was actively engaged in fish exports to various regions of the eastern Mediterranean, including the Levant, Anatolia, and Cyprus (Van Neer et al., 2005). The primary species involved in this trade was the Nile perch, remains of which have been documented in significant quantities at numerous archaeological sites across Israel—for example, at Lachish (Lernau and Golani, 2004), Jerusalem (Reich et al., 2008), and Tel Rehov (Lernau, 2020). Additional Nilotic species have also been identified in the Levant, though in considerably smaller quantities.

It is assumed that Nile perches were transported by boat to coastal ports, from which they were procured and subsequently distributed inland alongside locally sourced marine fish. As noted, the presence of luxurious Egyptian statuary on the LBA acropolis of Hazor (Connor et al., 2017) attests to strong and direct ties between the local elite and the Egyptian imperial administration. However, the occurrence of imported Nilotic fish such as Nile perch—both at Hazor and at other inland sites—should not be interpreted as evidence of direct contact with Egypt. Rather, such finds likely reflect participation in broader regional trade networks through which Egyptian goods were disseminated.

A possible explanation for the pronounced difference in the composition of local freshwater fish vs. marine and imported species between Hazor and other sites in the southern Levant is that merchants supplying fish from coastal markets may not have reached the site. This explanation, however, appears unlikely, given Hazor's location along a major route to the north and its well-documented participation in international trade. It is also unlikely since such fish made their way to other inland sites such as Lachish and Rehov. We therefore propose to explore an alternative explanation for the relative scarcity of traded fish at Hazor.

6.3 Fish as social markers?

As noted above, the number of bones of nonlocal fish found in the lower city and the acropolis is very small: only 7% of the assemblage of the lower city (NISP = 12) and 4% of the assemblage from the LBA palace (NISP = 10), indicating similar preferences.

The limited variety of nonlocal fish in elite contexts (the LBA palace) suggests that fish consumption at Hazor was not associated with luxurious or elite consumption practices. Instead, fish appear to have been a subsistence food, reflecting a focus on survival rather than conspicuous consumption. The presence of Egyptian royal statues underscores the close diplomatic and cultural ties between Hazor's ruling class and the Egyptian elite, implying that the absence of imported Nilotic fish cannot be attributed to a lack of trade connections. Thus, we suggest that nonlocal fish were not used as social markers in feasts and other food consumption activities at Hazor.

This dynamic recalls medieval Europe's distinction between social classes: "those who could, gorged themselves; those who couldn't, aimed to" (van der Veen, 2003:412 quoting Weber, 1973:202). The prioritization of quantity over quality, as observed in case studies from Goa, West Africa, and Bahrain, is common in societies where lifestyle differences are relatively modest. These studies show that, in more rigidly hierarchical societies, elites tend to emphasize exotic and foreign foods (van der Veen, 2003:412, 415–416, quoting Goody, 1982). This is not to reject the existence of social differentiation between the ruling elite—reflected in the material culture of the administrative palace and Temple 7050—and the residents of the lower city. Rather, it suggests that the lifestyle gap between these groups may have been less pronounced than often assumed. Thus, in spite of food being used as a social marker in other cases (e.g., geese at LBA Lachish; Koch, 2014), this was not the case at Hazor. Here fish do not appear to have served as a status marker for the elite, and exotic species played little or no role in articulating the city's internal social distinctions (for a full discussion on feasting activities at Hazor, see Zuckerman, 2007).

Thus, we suggest that, if fish consumption had any conspicuous nature at Hazor, it was driven more by quantity than by quality. A similar result was concluded based on the study of the ceramic assemblages from the LBA at Hazor, where local vessels are found in abundance and imported vessels are not (Zuckerman, 2015). The rulers of Hazor were not invested in importing exotic fish for display at feasts and may have preferred abundance as an exhibition of status and wealth (van der Veen, 2003:411–412). Accordingly, they relied on the richness of local freshwater fish and had no need to acquire nonlocal species.

6.4. Continuity of fishing techniques and fish consumption patterns

One of the more striking continuities observed is the persistence of fishing techniques over time. Despite temporal changes, local fish consistently made up the majority of the bone assemblage and were preferred over marine and Nilotic fish. Comparison of the local fish groups (Clariidae, Cichlidae, Cyprinidae) to all other nonlocal fish showed a significant difference between the LBA and Iron Age samples ($\chi2 = 45.97$, $p < 0.0001$). Yet, though there may be differences between the types of local fish consumed, it is still evident that local fish are significantly more prevalent than the nonlocal species. The abundance of fish in the Iron IIB could be a bias resulting from collection methods, since the third method described above was employed in a large area dated to the Iron IIB and smaller areas dated to the LBA. It could also be due to the fact that most of the loci excavated are dated to this period since reaching LBA levels requires excavating overlying Iron Age contexts beforehand.

Furthermore, there was a significant preference for small fish, both for local freshwater fish and for nonlocal fish. This pattern, uncommon at other sites, suggests the endurance of specific fishing traditions that favored smaller fish. It is therefore reasonable to propose that the fishing practices characteristic of Hazor in the second millennium BCE continued largely unchanged into the Iron Age.

6.5. Fish and identity

The consumption of food and drink, while fulfilling a basic biological necessity, also reflects practices of food preparation and production embedded within household structures. These practices play a critical role in shaping individual identities and social statuses, thereby linking the domestic sphere with broader political and economic systems (Dietler, 2006:223; Lyons, 2007:349–350).

Since preparing food is a culturally learned experience (Dietler, 2006:223), it is well known that food and foodways reflect and negotiate different aspects of identity (gender, race, status, ethnicity, etc.). By preparing and consuming food in a similar manner, people can show their association with certain groups (Twiss, 2019:129, with further references there). Thus, even though it is often said that "we are what we eat," this phrase could be amended in our case to "we are how we prepare what we eat," since identity is reflected not only by the food that we eat but also by the way we prepare it (Lyons, 2007:347; Welton, 2017:612–613).

Lyons (2007) has shown that differences in food consumption between different identities is reflected in the preparation and presentation of the dishes and not in their ingredients.

As noted above, a long gap of about 150 years separated the last LBA occupation at Hazor from the earliest Iron Age settlement. In addition, nearly all aspects of the city differed significantly between these two periods, including functions of the various areas of the city, construction techniques, and, most notably, the abandonment of the lower city, which had constituted an integral part of the expansive Canaanite urban center during the second millennium BCE. In contrast, as demonstrated above, fish consumption practices appear to have remained remarkably consistent across the transition from the LBA to the Iron Age, which includes the preference for local fish of smaller size. Another conspicuous aspect of this is the crushing of catfish skulls as described above. We suggest that this practice was associated with the preparation of some dish, probably a traditional stew, facilitating extraction of nutrients from inside the skull of the fish. The fact that the crushing of skulls persisted at least from the LBA[3] to the Iron Age and was found throughout all societal contexts during these times indicates a continuation of cultural traditions. In addition, the practice of crushing skulls of catfish—identified in both the lower city and the palace during the LBA—suggests that the same fish preparation technique was employed across different social strata. This pattern supports the argument raised above that fish consumption at Hazor was not a marker of social distinction but rather a shared culinary practice among various segments of the population. To date, this phenomenon—namely, consistent crushing of catfish skulls—was not identified, to our knowledge, at any other site in the southern Levant and is therefore unique to Hazor in the LBA and Iron Age.

Thus, though the consumption of fish is only one aspect of their material culture, it may strengthen the claim that the Iron Age inhabitants of Hazor were indeed the descendants of those of the Bronze Age. This is not based on practices or preferences of individuals but of a population, since these appear in both LBA and Iron Age assemblages, in both the lower city and the acropolis. Sharon Zuckerman has suggested this already, when examining "ruin cults" practiced at Iron I Hazor. Zuckerman proposed that the city's inhabitants during this period may have been descendants of the indigenous Canaanite population that departed the site in the 13th century BCE, maintaining cultural traditions and collective memory associated with the city's former prosperity and its eventual destruction (Zuckerman, 2011:392–393). In our opinion, the fish remains at Hazor strengthen this hypothesis, due to the fact that food preparation habits are a social construct and a learned experience, as noted above. However, asserting this requires an examination of other aspects of food preparation and consumption at Hazor.

[3] We have no data regarding fish from the Middle Bronze Age at Hazor as of yet.

7. Summary and conclusions

This paper examined fish remains from LBA and Iron Age contexts at Hazor, encompassing a range of settings including domestic, commercial, and industrial areas, as well as palatial, public, and monumental structures. The analysis demonstrated a notable continuity in fish consumption across these periods and contexts, in terms of species preference, anatomical parts consumed, and fish size. Furthermore, evidence for consistent culinary practices—particularly the crushing of catfish skulls—indicates a long-standing tradition in food preparation methods.

The persistence of these patterns, despite the city's destruction in the mid-13th century BCE and the subsequent settlement hiatus, suggests demographic continuity at Hazor. Moreover, the presence of similar fish species in both elite (palatial) and non-elite (domestic and commercial) contexts during the LBA indicates that fish consumption was not a marker of social differentiation; in fact, evidence shows that similar dishes were consumed in both parts of the city. In other words, fish did not serve to distinguish between social classes. It is plausible, however, that social distinction was expressed not through the *type* of fish consumed (e.g., local vs. imported) but rather through the *quantity* of fish served. However, as noted above, this is only a conjecture and cannot be proven based on the available data.

These findings contribute to broader discussions of cultural continuity, foodways, and social organization in the southern Levant during the transition from the LBA to the Iron Age. Further comparative studies may help refine our understanding of how culinary traditions intersect with identity and resilience in times of upheaval, though this is beyond the scope of the current paper.

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