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Research Article/Araştırma Makalesi

Bee Houses as a Rural Construct: Sampling from Konya, Türkiye

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Abstract

Within the historical and geographical continuity of beekeeping culture, a rural building typology has developed for the storage of hives and use of bees. The bee house structures, also known as apiaries and function as shelters used by bees to produce honey are unique and distinctive components of the rural context. The architecture of these structures can be examined in a typological framework through their tectonic qualities as they differ in terms of material, construction logic, and architectural design. This study addresses the bee house as a rural architectural type and interprets the typological reading by examining the structural construct and logic of this building type through the concepts of "tectonic" and "syntax". To illustrate the discussion, a group of bee houses identified and documented in the field surveys conducted in rural areas within the borders of Konya province in Turkey are introduced and contextualized; typology is prepared by classifying the documented sample according to construction techniques. For comparison, Antalya examples which set the basis of the typology are briefly mentioned.

Keywords: Apiary, Bee House, Beekeeping, Konya, Rural Architecture, Tectonic, Syntax.

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Kırsal Bir Yapı Kurgusu Olarak Arı Evleri: Konya Örnekleri

Öz

Arıcılık kültürünün tarihsel ve coğrafi sürekliliği içinde, kovanların depolanması ve arıların kullanması için kırsal bir yapı tipolojisi gelişmiştir. Arı kovanı olarak bilinen ve arıların bal üretmek için kullandıkları birimlerin depolandığı barınaklar olan arı evleri, kırsal bağlamın yapı yapma dinamikleriyle uyumlu, çevre estetiği içinde bir kimlik öğesi oluşturan ve peyzaj içinde görünürlüğe ve özgün siluete sahip küçük ölçekli yapılardır. Bu yapıların mimarisi, malzeme, yapı mantığı ve mimari tasarım açısından farklılık gösterir; bu anlamda bu yapılar tektonik nitelikleri ile tipolojik bir çerçevede incelenebilir. Bu çalışma, arı evini kırsal bir mimari yapı tipi olarak ele almakta, örneklemekte ve bu yapı türünün konstrüksiyon kurgusunu ve yapısal mantığını "tektonik" ve "sözdizimi" kavramları üzerinden okuyarak tipolojik bilgiyi anlamlandırmaktır. Tartışmayı örneklendirmek için, Konya ili sınırları içindeki kırsal alanlarda yapılan saha araştırmalarında tespit edilen ve belgelenen bir grup arı evi bağlam olarak kullanılmış, belgelenen örnekler yapım tekniklerine göre sınıflandırılarak tipoloji oluşturulmuştur. Karşılaştırma amacıyla tipolojinin altlığını oluşturan Antalya örneklerinden kısaca bahsedilmiştir.

Anahtar Kelimeler: Kovan, Arı evi, Arıcılık, Konya, Kırsal Mimari, Tektonik, Sözdizimi.

Introduction

The architectural elements of the rural environment are not limited to buildings intended for human use and include buildings inhabited by animals. In this respect, although the names and/or uses of rural architectural[1] elements vary from one region to the other, houses, mills, granaries, processing units, vineyards fountains, laundry and/or washing places, village rooms, and mosques, for example, are the common elements of rural landscape in Anatolia while stables, barns, poultry houses, bee houses, bird or pigeon houses are those elements of the same

1 Rural architecture and vernacular architecture are often used interchangeably, and for most cases this usage may seem appropriate. The term 'rural architecture' refers to constructions "associated with the countryside, using free compositions, asymmetry and vernacular detail", while 'vernacular architecture' is used to define the "unpretentious, simple, indigenous, traditional structures made of local materials and following well-tried forms and types." (James Stevens Curl (ed.), *Oxford Dictionary of Architecture and Landscape Architecture*, Oxford 2006, pp. 238, 290). Hence, one is generally used to refer to environment, while the other to local building traditions which are practiced in both rural and urbanized contexts. The authors use the term rural architecture as the structures discussed in the article are an element of the rural context built in vernacular detail.

landscape that are made by man for the use of animals. Among the animal shelters, bee houses are built outside the borders of a settlement, at places where there is less human traffic. 'Bee houses', 'bee shelters' or 'apiaries' are small structures built in the rural landscapes by human labor to provide shelter for beehives and private space for bees, to protect beehives against wild animals, climate, and theft and to ensure that honey can be obtained under supervision. The bee house is a constituent element of rural life cycle and an aspect of environmental aesthetics, and one of the few building types that are inhabited by animals.

Studies on rural architecture focus, in general, on houses and buildings inhabited by humans, seemingly because they are more numerous, substantial, and considered architectural in comparison to buildings used by animals, such as bee houses, that remain less documented. However, in the course of its historical continuum and geographical spread bee houses[2] have acquired a distinctive building tradition and typology, which is characterized by an assemblage of architectural components and materials designed to amalgamate in a structural system. The relationship between the form, structure, and function of a bee house, in this respect, is a historical and a formative one and enables to contextualize bee house as both a 'shelter' and a 'building'. The question "How and in what ways were the struggles to hold on to life under difficult conditions of the Taurus mountains represented on different scales of architecture?" [3] in this context, defines an inclusive framework that encompasses all types of rural elements and life practices, through which it becomes possible to approach an animal house as a subscale of the rural context, to understand it as a 'construct', and to discuss in which ways such structures relate to their context, create a value for the rural culture, and establish social and economic relations between the user and the end product, both as structure the product obtained. This paper addresses the first issue and makes a reading of the structural ontology and functionality of bee houses by using 'tectonics' and 'syntax' as compatible conceptual themes. The examples sampled represents a

2 Although they have similar forms and uses, the names of bee houses differ in local usage; bee houses are called "*seren*" in the Mediterranean Region, "*hanay*" in Konya and its surroundings, and "*petekhanı*" in the vicinity of Artvin. (Salih Ceylan, "Kırsal Mimarinin Örneklerinden Serenlerin Coğrafi Açıdan İrdelenmesi", *Doğu Coğrafya Dergisi/Eastern Geographical Review,* 17 (2012), pp. 151-168.) In this study, it is found more appropriate to use the term "bee house", as it refers to a building typology, rather than the local term that associates with a specific place.

3 Kemal Reha Kavas, *Environmental Aesthetics of the Rural Architectural Tradition in the Mediterranean Highlander Settlement: Ürünlü (Akseki-İbradı Basin)*, AKMED ADALYA Supplementary Series 13, Suna and İnan Kıraç Research Institute on Mediterranean Civilizations, Antalya 2016, p. 86.

categorization, description and visualization of bee house structures and provide a context for the discussion, while the brief history of bee keeping compiled in the first section aims to demonstrate the historical roots of the practice and its spatialization.

Ancient Beekeeping

As a sweet food source with high energy density, honey has been a valuable food in many cultures throughout history, and various spatial arrangements have been made to collect and produce it. While beekeeping and honey collecting practices, which continue in similar forms in today's rural contexts, were largely developed in antiquity, its collection goes back to prehistoric times. The first predecessors of bees, whose existence dates back earlier than the existence of humanity, are the bee fossils that are found in ambers, dating back to 80 million years ago. It is assumed that before the human intervention bees formed their nests in natural cavities, rock dents or tree cavities, by applying a fractal geometry and human-controlled production of honey has begun with the development of a hive system, designed in a similar geometrical form.[4]

Written and archaeological evidence from all the great cultures and empires of ancient times show that bee keeping culture has flourished and developed in an uninterrupted sequence[5]. The earliest evidence of honey collection in Europe comes from prehistoric rock paintings. Depictions of honey hunting scenes are found in the Mesolithic Period rock paintings in Eastern Spain (8000-2000 BC)[6]. The rock paintings of Barranc Fondo, Castellion, dated to 4500-4000s BC show five figures trying to reach a bee nest by climbing the rock surface with a ladder, and another group waiting below to share the honey[7]. Another rock painting dated to the same period and found in the cave of Bicorp La Arana, in Eastern Spain

4 The liquid honey could have been consumed not only as a food but also an energy supply for meat and plant gatherers (Crittenden, *ibid*, pp. 257-258).

5 Fani Hatjina, Georgios Mavrofridis and Richard Jones, (eds.), *Beekeeping in the Mediterranean, From Antiquity to the Present.* Eva Crane Trust, Nea Moudania 2018; Louise Cilliers and Francois Pieter Retief, "Bees, Honey and Health in Antiquity, *Akroterion*, 53 (2008), pp. 7-19; Ronan James Head, "A Brief Survey of Ancient Near Eastern Beekeeping", *The FARMS Review*, 20/1 (2008), pp. 57-66.

6 Eva Crane, *The Archaeology of Beekeeping*, Cornell University Press, New York 1983, p. 21; Eva Crane, *The World History of Beekeeping and Honey Hunting,* Redwood Books Ltd. Duckworth, New York 1999, pp. 43-44.

7 Crane, *The Archaeology of Beekeeping,* p. 22.

shows two figures standing on a ladder. The one at the top is depicted in front of a bee nest and as holding a container to carry the honeycomb[8]. The rock paintings discovered in the Drakensberg Mountains in Natal, South Africa, show nests that consist of honeycombs, whose centers are painted with dark and the outer parts with light colors[9]. In the paintings of Jambudwip Cave in Parmachi, Central India bees are depicted as dots and hunters as standing as far as possible from the nest and trying to reach it with a ladder and a pole in the shape of a fork[10]. A depiction of honeycombs and a bee nest on the wall of a unit in Çatalhöyük shows that bees were considered important enough to be painted around 7000 BC, when agriculture and social interactions between groups of people had started and the number of permanent settlements increased[11].

Along with settled life the use of honey and beeswax increased. It is assumed that pots or baskets had begun to be put outside for the bee colonies to use them as nests, thus, the first actions towards human-controlled beekeeping were taken. The first controlled and systematically carried out beekeeping activities by humans were realized in Egypt, in c. 2400 BC, as understood from the wall paintings of the period which suggest that beekeeping was an important production activity especially in the Nile Delta[12]. Honey bees were depicted as part of the King's symbol in Egypt, from the foundation of the first dynasty in Egypt (c. 3100 BC) to the Ptolemais assuming power in 305 BC. In the ancient Egyptian mythology, it was believed that the tears of the Egyptian Sun God Ra, turned into bees on their fall to earth, and the Temple of Neith was called the "bee house"[13]. Reliefs depicting beekeeping are found in temples, for example, in the Ne-User-Re Temple of the Sun in Abu Gorab, Lower Egypt, that dates to c. 2400 BC and shows a beekeeper working on his knees in front of nine horizontal beehives in the form of

8 Crane, *The Archaeology of Beekeeping*, p. 21.

9 Crane, *The Archaeology of Beekeeping*, p. 23; Crane, *The World History of Beekeeping and Honey Hunting*, pp. 49-50.

10 Crane, *The Archaeology of Beekeeping*, p. 28, 31; Crane, *The World History of Beekeeping and Honey Hunting*, p. 73

11 James Mellart, "Excavations at Çatal Hüyük, 1962: Second Preliminary Report", *Anatolian Studies*, 13 (1963), pp. 43-103; Crane, *The Archaeology of Beekeeping*, p. 35; Crane, *The World History of Beekeeping and Honey Hunting*, pp. 40-41.

12 Crane, *The World History of Beekeeping and Honey Hunting*, p. 162.

13 Gene Kritsky, *The Quest for the Perfect Hive: A History of Innovation in Bee Culture*, Oxford University Press, Oxford 2010, p. 12.

pots[14], which are known to have been used in Egypt since pre-dynasty[15]. The wall painting in the Luxor Rekhmire Temple in Upper Egypt describes the beekeeping practiced in ancient Egypt in more detail and shows two beekeepers working in front of three hives; the standing beekeeper is burning an incense to move the bees away from the hive while the kneeling beekeeper is putting the honeycomb into bowls[16]. The honeycombs are taken first from the hive to the bowls and then to a larger container and the honeycomb is put on top to make the honey start dripping. In the last stage, honey is put into smaller bowls and stored. The scene demonstrates that Egyptians used vapor and incense burning to collect honey[17]. The wall painting of the Pabasa Tomb in Luxor (c. 660 BC), depicts bees flying in front of cylindrical hives, a kneeling beekeeper and visualization of honey storage[18].

Lineer B inscriptions have proven that beekeeping was practiced in Crete during the Late Bronze Age and the Minoans fermented honey, made honey mead and offered it to their gods[19]. There are depictions of beekeeping, hive and bee among the figures carved on the Phaistos Disc found in the palace excavations in Crete and dated to 1600s BC. The disc is thought to be a solar calendar showing the time of agricultural activities and religious rituals and the figures relating to beekeeping are shown associated with certain dates. Hive symbols are engraved on various other dates written on the disc. These signs probably indicated the time to collect honey, clean the hives and time to pour honey mead into the soil on behalf of the gods.[20]. Written sources and analysis of organic remains found in the excavations showed that honey and bee products were also used in the Greek countryside during the Bronze Age[21]. Another proof of beekeeping during the

14 Crane, *The World History of Beekeeping and Honey Hunting*.

15 Crane, *The Archaeology of Beekeeping*, p. 36; Crane, *The World History of Beekeeping and Honey Hunting*, p. 164; Kritsky, *The Quest for the Perfect Hive: A History of Innovation in Bee Culture*, p. 12.

16 Crane, *The World History of Beekeeping and Honey Hunting*.

17 Crane, *The World History of Beekeeping and Honey Hunting*, p. 164; Kritsky, *The Quest for the Perfect Hive: A History of Innovation in Bee Culture*, p. 14.

18 Kritsky, *The Quest for the Perfect Hive: A History of Innovation in Bee Culture*, p. 20; Crane, *The Archaeology of Beekeeping*, p. 38; Crane, *The World History of Beekeeping and Honey Hunting*, p. 167.

19 Mary Kilbourne Matossian, "Phaistos Disk: A Solar Calendar, Contribution to a Decipherment", *Mediterranean Archaeology and Archaeometry,* 13/1 (2013), pp. 235-264.

20 The jar figures carved in front of a hive sign in two places are thought to indicate the beginning of the honey harvest season (Matossian, ibid., p. 242).

21 John Ellis Jones, "Hives and Honey of Hymettus: Beekeeping in Ancient Greece", *Archaeology,* 2 (1976), p. 90.

Early Bronze Age are the smoke pots found in Macedonia and Olympia, which are thought to have been used to remove bees from their nests and thus are informative about the practice of bee keeping[22].

Beekeeping was an established culture in the Hittites as well. Among the diagnostic archaeological finds is a container in the shape of a flask, which is found in Boyalı Höyük in Çorum, and dated to 1650 BC. The residual analysis showed that the black cumin seeds found inside the flask were mixed with honey and beeswax[23]. Honey is mentioned many times in the Hittite cuneiform tablets which include a number of beekeeping terms. Accordingly, honey was regarded as a valuable source of food and referred to as "*Milit*" and "*LÀL*"[24]. The cuneiform tablets also indicate that honey was mixed with oil and mud and used for the production of god figurines, and also offered to the gods of the underworld. Hittites associated bees with the arrival of spring, awakening of nature, abundance and fertility[25] and used honey in the "*Ammihatna Ritual"* which was performed to heal mental and physical diseases. In this ritual, honey was used to cure people who were spiritually contaminated or became physically ill because they were fed with some enthralled, disrupted, or bad substances[26]. Beekeeping and honey must have

22 Haralampos V. Harrissis, "Beekeeping in Prehistoric Greece", Hatjina, Mavrofridis and Jones, eds. *Beekeeping in the Mediterranean, From Antiquity to the Present,* Eva Crane Trust, Nea Moudania 2018, p. 26.

23 Bekir Salih, Tunç Sipahi and Emel Oybak Dönmez, "Ancient Nigella Seeds from Boyalı Höyük in North-Central Turkey", *Journal of Ethnopharmacology*, 124 (2009), p. 419; Sedat Erkut, Hititler'de Arı ve Bal, *Acta Turcica*, 3/1 (2011), pp. 36-39.

24 Hüseyin Üreten, "Eski Anadolu'da Arı ve Bal", *International Journal of History Studies*, 3/3 (2011), p. 372; Hans G. Gütterbock and Harry A. Hoffner, "The Hittite Dictionary" of the Oriental Institute of the University of Chicago, 1989, p. 250. The name of the city of Malatya, which is mentioned as "Melita" in the written documents of the Assyrian Trade Colonies, is mentioned as "Meliddu, Melide, Milid, Milidia" in the Hittite documents. The name of the city may have been derived from "Melid", which means "honey" in Hittite (Hasan Ali Şahin, "Geç Hitit Beylikleri", *OANNES – Uluslararası Eskiçağ Tarihi Araştırmaları Dergisi-International Journal of Ancient History,* 1/2, Eylül/September (2019), p. 142). There are similar words used to mean honey and sweet in Hittite ("milit", "miliddu", "maliddu"). Indeed, the Hittites may have called Malatya a sweet city, a honey city, in a metaphorical sense as the city was known with the abundance of fruit orchards and that the apricot is a sweet fruit like honey and has a similar color. The fact that Evliya Çelebi mentions about Malatya having a kind of white honey also supports this possibility (Evliya Çelebi, *Günümüz Türkçesiyle Evliyâ Çelebi Seyahatnâmesi: Bağdad-Basra- Bitlis - Diyarbakır Isfahan - Malatya - Mardin - Musul Tebriz - Van,* haz. Seyit Ali Kahraman - Yücel Dağlı, 4. Kitap 1. Cilt, Yapı Kredi Yayınları, İstanbul 2010, p. 16).

25 Üreten, *ibid*, p. 368.

26 Üreten, *ibid*, p. 371.

been very important for the Hittites, since the penalties to be imposed in case of theft of bees and honey were specified in the laws[27].

Over time, especially after it had started to be used in the construction of temples and religious rituals, the use of honey has expanded and began to be considered sacred[28]. The protection of the hives from external factors and the privacy of the space used by the bees had also emerged as a necessity. The beekeepers had begun to keep the hives in an orderly manner in secured environments. The oldest known beehive and bee house was discovered during the 2005 and 2007 excavations at Tel Rehov in Israel. The hives which are dated to c. 875 BC, are in cylindrical form and found stacked in layers, similar to the beehives depicted in the wall painting of the Luxor Rekhmire Temple in Upper Egypt[29]. The chemical analyses found wax residues in the hives which were in the form of cylindrical shells made of animal manure and straw-mixed clay[30]. They were placed on terraces, arranged in at least three rows with corridors between them, and were stacked about 1.5m below the ground level[31]. While no evidence has been gathered as to whether the bee house was covered or not, it is thought that it was protected by a temporary and partial roof made of wood, reed or fabric which presumably covered only the hive rows to protect them from rain in winter and heat in summer. The high number of the hives found in the site and the allocation of such a large and orderly honey production area in the settlement center indicates that honey was an important substance that had an economic value and also used for wax trade. The layer of brick and wood residue found on the hives implies that the

27 Üreten, *ibid*, p. 368.

28 Honey is interpreted as a gift of God to people in ancient Egypt (Hilda M. Ransome, *The Sacred Bee in Ancient Times and Folklore*, Dover Publications, Mineola, N.Y. 2004, p. 33). The priests were given honey cubes for use in sacred ceremonies. In addition to be the food source of sacred animals in the temples, honey was used in various religious rituals (Süleyman Bulut, "Eski Akdeniz'de Arı Ürünleri", in E. Dündar, Ş. Aktaş *et.al.* (eds.), *Havva İşkan'a Armağan, LYKIARKHISSA Festschrift für Havva İşkan*, Ege Yayınları, İstanbul 2016, p. 168. In Mesopotamia, around 2450 BC, honey was used during the construction and completion of the temple of King Gudea of Lalash. Nabonidus, the King of Babylon, poured honey, oil and wine on the walls and wooden architectural elements of the Temple of Sin (Bulut, *ibid*, p. 169).

29 Kritsky, *The Quest for the Perfect Hive: A History of Innovation in Bee Culture*, p. 251; Georgios Mavrofridis, "Urban Beekeeping in Antiquity", *Ethnoentomology*, 2 (2018), pp. 52–61.

30 Amihai Mazar and Nava Panitz-Cohen, "It Is the Land of Honey: Beekeeping at Tel Reḥov", *Near Eastern Archaeology*, 4 (2007), pp. 205-210.

31 Mazar and Paintz-Cohen, *ibid*, p. 207.

apiary may have been covered[32], in order both to secure it and also to keep the bees inside to prevent them disturbing the inhabitants[33].

Beekeeping was performed by the ancient Greeks who associated apiculture with celestial events as well. For example, the Pleiades, a group of seven stars belonging to the Taurus constellation, were seen by Hesiod as a sign that indicated the beginning of the organizations related to agricultural activities, including apiculture[34]. It has been suggested that apiaries were in use in Athens in the last quarter of the 5th century BC and that the practice had started with the Peloponnesian War during when the Athenians, who were living in the countryside had moved to the city to escape the Spartans. The refugees had brought hives with them, and most likely utilized the existing structures such as the city walls to place them horizontally. Many clay hives which are found in the Agora excavations also attested that honey production took place in the city[35]. The evidence showed that honey was collected in clay and ceramic hives[36] in both cities and the countryside. The earliest evidence of rural beekeeping, for the time being, comes from the Classical Period and from the farmhouse found in Vari, Attica. It is suggested that similar types of pottery hives were placed inside the perimeter wall of the house[37]. Apiculture was actively practiced in the Roman period, as seen in the ancient Roman writers who provide information about the shape, material and use of hives[38]. Varro[39] for example, mentions that trees, bark and fennel stems could be used in the construction of hives, hives could be made in the form of clay pots and that the best hives were made by bark, and the worst by soil since the latter was rapidly affected from cold, rain and heat. Varro also mentions that the beekeepers reached honeycombs by lifting the hive lids because the hives were placed inside the walls. Columella states that hives were made with similar materials in different regions, the worst

32 Mazar and Paintz-Cohen, *ibid*, p. 205.

33 Mavrofridis, *ibid*, p. 54.

34 Kilbourne Matossian, *ibid*, pp. 241-242.

35 Susan Rotroff, "Hellenistic Pottery: The Plain Ware", *The Athenian Agora*, Vol. XXXIII, Princeton, NJ: The American School of Classical Studies at Athens, (2006), p. 130.

36 Virginia R. Anderson-Stojanović and John Ellis Jones, "Ancient Beehives from Isthmia", *Hesperia*, 71/4 (2002), pp. 345-376; Jane E. Francis, "Experiments with an Old Ceramic Beehive", *Oxford Journal of Archaeology*, 31/2 (2012), pp. 143-159, 201; Hatjina *et.al.*, *ibid*.

37 Jones, *ibid*, p. 90.

38 Hatjina *et.al.*, *ibid*.

39 *De Re Rustica* III.16.17.

of which were made of soil, and that the hives should be positioned in such a way that they would receive the midday sun in winter[40]. Columella[41] also mentions that the hives should be transported at night to prevent honey from melting and harming the bees[42].

Beekeeping and honey collection practices have survived in various forms and methods since antiquity, and are seen in modern rural contexts often in the form of built structures, ranging from independently constructed bee houses, to hives stacked horizontally on ground or on elevated locations, arranged as such in existing physical situations such as in a wall niche, tree cavity, rock cavity or in between tree branches. Various applications of these can still be found in the Anatolian rural landscape as well [43]. Types of bee houses with roofs, built on elevated stone platforms or surrounded with walls are also common today; ensuring the safety of hives and bees has become an increasing necessity with honey gaining significance as a special nutrient and a luxurious consumer good in the urban context[44].

Bee Houses in Rural Konya

The rural landscape in the Mediterranean Region basin, where beekeeping is practiced in built structures, is one of the potential regions to compile a typology.

40 Kritsky, *ibid*, p. 252.

41 IX.14.20.

42 Crane, *The World History of Beekeeping and Honey Hunting*, p. 347.

43 For example, Ürünlü Village, Bursa (Güven Gümgüm, "Ürünlü (Kîte)'de Ev Duvarları İçinde ve Bahçe Duvarları İçinde Yer Alan Arılıkların Tespîti İçin Ön Araştırma Çalışması", *Uludağ Bee Journal*, 15/2 (2015), pp. 80–88; Cappadocia (Roberto Bixio and Andrea D. Pascale, "A New Type of Rock-cut Works: The Apiaries", In M. Parise (ed.), *Proceedings of the International Workshop on Speleology in Artificial Cavities. Classification of the Typologies of Artificial Cavities in the World* (Torino/ Italy, 18-20 May 2012), *Opera Ipogea* 1, (2013), pp. 62-68; Göreme (Crane, *The World History of Beekeeping and Honey Hunting*, p. 137), and the village of Karacaören in Ürgüp (Savaş Sarıözkan, Abdullah İnci, Alpaslan Yıldırım and Önder Düzlü, "Kapadokya'da Arıcılık", *Erciyes Üniversitesi Veteriner Fakültesi Dergisi*, 6/2 (2009), pp. 143-155.

44 For bee houses surrounded by a wall or a fence made of reeds and shrubs, and protected by roofs see (Crane, *The World History of Beekeeping and Honey Hunting*, pp. 324-325) and those used in Antalya, in Patara Hurmaköy and Muarönü see Süleyman Bulut, "Lykia'da Arıcılık: Seren ve Çevre Duvarlı Arılıklar Işığında Antik Geleneği Arayış", in Havva İşkan and Fahri Işık (eds.), *Kum'dan Kent'e Patara Kazılarının 25. Yılı Uluslararası Sempozyum Bildirileri*, (11-13 Kasım 2013), Ege Yayınları, İstanbul 2015, pp. 97-132. The wooden beehives which are hanged from trees with ropes made of plant fibers at a certain height from the ground to protect them from ants, badgers, and bears is another commonly used method of security in Africa (Crane, *The World History of Beekeeping and Honey Hunting*, p. 260)

Bee houses built in the form of independent structures that are found in the rural landscape in different regions of Türkiye exemplifies the practice, and construction methods of bee houses that are in use[45]. The bee houses used in rural Antalya and Konya provinces in this respect, exhibit an architectural context in which such components as body, platform, beams, and roof form a tectonic construct (Figure 1).

A survey conducted in 2017 located a total of 12 bee houses in an area of approximately 200 km to the west and east of Antalya[46]. The bee houses documented in this survey provided the terminology and the structural properties that are used to describe the tectonic construct of the bee houses. Another survey conducted in 2018, identified a group of bee houses in rural Konya (altogether 25 in number) that are utilized as the sample in this paper. Although the surveyed examples form a modest sample, they demonstrate that the practice of obtaining honey is still carried out by using the structures and methods that had already developed in earlier eras (Figure 2).

In general, the location of the surveyed bee houses in relation to the nearby settlements varied and depended on their proximity to a water source. They are generally built by the owners of the hives *(karakovan),* using mostly local stone and wood (cedar, pine or oak), according to their availability in the region. Traditionally, the beehives are brought to the bee houses at the end of May, and honey is harvested in September-October. Occasionally the hives are not transported, and honey is left in the hives to provide food for the bees in winter.

Two structural elements, body and platform, shape the architecture of bee houses. They vary in terms of the construction details applied in bringing these two elements together and the materials used. In other words, they differ in terms of

45 The history of honey production in Anatolia dates back to the Hittites, but current historical evidence concentrates more on the ancient period, see (Üreten, *ibid*, p. 368)

46 The survey documented 12 bee houses: 2 in İmecik village-Korkuteli, 3 in İmecik straight, 2 in Avdancık area-Küçüksöğle Village-Elmalı district, 3 in Gazipaşa, 1 to the east of Akoluk District-Gazipaşa, and 1 in the Akarca locality-northeast of Çamlıca District. For other studies in Antalya see, Reha Günay, "Ambarlar, Arı Serenleri ve Likya Mezarları", in R. Günay (ed.), *Elmalı ve Yöresel Mimarlığı*. Ege Yayınları İstanbul 2008, pp. 285-294; Öznur Tanal, "Ölümden Dirime Serenler", *Antalya Kültür ve Turizm Dergisi*, 1/5 (2011), pp. 120-126; Salih Ceylan, "Kırsal Mimarinin Örneklerinden Serenlerin Coğrafi Açıdan İrdelenmesi", *Doğu Coğrafya Dergisi/Eastern Geographical Review,* 17 (2012), pp. 151-168; Mehmet Uysal - Yavuz Arat, "Türk Halk Kültürünün Yerel Mimari Mirası: Arı Serenleri", *Milli Folklor,* 26/102 (2014), pp. 154-167; Bulut, *ibid,* 2015 and *ibid,* 2016.

architectural tectonics. The documented bee houses in Konya, in this sense, are categorized into three groups according to their tectonic construct: "bee houses with wooden platforms built on a tree", "bee houses with wooden platforms built on a rubble stone body", "bee houses built on a stone platform". This classification is also useful to show that bee houses differ in terms of structure rather than architecture.

Bee Houses with Wooden Platforms Built on a Tree[47]

The three bee houses identified are constructed by building wooden platforms, approximately 5.5x5.5m in size, on trees, nearly 6m from the ground, and by lining the hives on these platforms (Figure 3). The hives are covered with tree bark to protect them against external factors. A stream and a fountain used by the upland/plateau settlement (*yayla*) are the nearby water sources in the vicinity. Such facts as difficult accessibility to the region due to topography, the presence of grown-up trees and the availability of wood led the owners choose this construction technique that utilized the existing trees as the bodies of the bee houses. While this allowed for a rapid and easier construction, compared to building an independent structure it requires cooperation and use of additional materials such as ladders to access the bee house to collect honey and clean the hives.

Bee Houses with Wooden Platforms Built on a Rubble Stone Body [48]

The bee houses of this type can be further divided into two; those with or without openings on the body (Figures 4, 5). The body heights vary between 2.20m and 6.00m from the ground, according to the topography. Those without windows were constructed fully with stone infill masonry technique (Figure 4). In these the body is made of rubble stone with no mortar, and wooden beams. The beams are placed with a spacing of about 0.55cm. The thick beams, usually made from juniper trees, protrude from the corners. In the construction of the wooden platform, the longer beams called *düvers*[49] are placed after positioning a certain number of main beams (*hatıl*). *Düvers* protrude from the main body, the distance of which is determined according to the dimensions of the body and the number of hives to

47 Location: Beşpınar (*Pazarboğazı),* Dikilitaş Plateau-Dereköy, Bozkır District

48 Location: Beşpınar, Dereköy-Dikilitaş Plateau, Bozkır-Bozkır District- Arslantaş Village-Arslantaş Plateau, Bolay-Taşkent.

49 Ceylan, *ibid*, p. 161.

be stacked. The *dravas*, the thin wooden floor beams, are lined up in the opposite direction on top of the *düvers*. The wooden flooring is laid on top of the *dravas*, in the opposite direction, and thus the elevated floor on which the hives (*karakovans*) are placed is obtained. The beehives are placed on top of each other, the in-between areas are filled with tree bark or straw-mixed mud, their tops and the in-between areas are plastered and covered with bark or metal sheet protective cover. The upper parts of the two bee houses of this type are not well preserved as they are out of use (Figure 4b, c). Five of the seven bee houses are still in use (Figure 4a, e, f, g, h). One of the remaining two is left unfinished (Figure 4g) during the construction while the other is destroyed (Figure 4h). One of the bee houses is modified by the owners; the wooden platform is replaced by a reinforced concrete one and the main body is plastered (Figure 4f). Although the repairs are made by using materials non-compatible with the environment, the bee house still maintains its place, silhouette and function in the rural context.

The body of the bee houses located in Bolay locality are built similarly, by using rubble stone and wooden beams but they have openings (Figure 5). The beams are arranged with a spacing of about 0.65cm. The thick beams, usually made from juniper trees, protrude out from the corners as in the other examples. After the body is constructed to a certain height by rubble stone infill masonry technique, an opening is left on the body to enable a person crawl inside and reach the wooden platform (0.55x0.65cm). The cavities left, which vary between 4.00m to 2.95m high from the ground, according to the topography, are reached by the *puştivans* that protrude from the main body at regular intervals and form a staircase. The wooden thin beams, *düvers*, are placed after the placement of a certain number of main beams (*hatıl*). They protrude from the main body, the distance of which is determined according to the dimensions of the body. The beams that compose the wooden platform are laid in the opposite direction. The wooden flooring on top is also placed in the opposite direction of the beams that are fixed underneath. The beehives are placed on top of each other and insulated by using straw and fertilizer mixed with mud (cow dung and juniper bark). The wooden frame on three sides of the wooden platform is enclosed by a frame wall, the top is covered with sheet metal in the form of a saddle roof and thus the hives are covered.

Bee Houses Built on a Stone Platform [50]

The bee houses of this type are built with rubble stone bodies that are placed on a high stone platform (Figure 6). In a particularly light-sloping terrain, it became a common practice to build a platform from rubble stone by using dry wall technique to correct the slope, to obtain a flat platform and to lay the beehives on this platform. The hives are covered, as usual, with a mud mixed with cow manure and straw for insulation purposes. They are stacked on top of each other to gain the profile of a vaulted roof and are covered with sheet metal to protect them from climate changes.

Bee House as a Construct: Tectonic, Syntax and Architecture

The bee house is a rural structure that embodies a bonding between form, material, and function which defines a tectonic, in which structure becomes blended with architecture and craft according to the potential offered by the context and material, and the space conditioned by the function. The potentials of each material and how they are brought together make that structure and the space it offers possible and feasible.

The concept of 'tectonics', as discussed in architecture by Kenneth Frampton[51] refers to the study of an architectural form with both physical and cultural dimensions, and includes discussing climatic comfort, culture and physical environment as well. In architecture, the physical dimension corresponds to the material and technical characteristics of the buildings, while the cultural dimension includes local culture, traditions and daily life characteristics that accord with the natural character of the region[52]. The concept of tectonic proposed by Frampton also emphasizes that architecture is a structural craft, noting that modern architecture relies not only on such principal elements as 'space' and 'abstract form' but also on 'structure' and 'construction' as well. Frampton, in this respect, discusses the history of formal development in contemporary architecture as a poetic development of structure and construction[53]. Semper[54], who defines construction as

50 Location: Arslantaş Village, Bozkır District.

51 Kenneth Frampton, "Rappel a l'Ordre: The Case for the Tectonic", *Architectural Design*, 60/3-4 (1990), pp. 23-32.

52 Kavas, *ibid*, p. 84.

53 Frampton, *ibid*.

54 Gottfried Semper, *Mimarlığın Dört Öğesi ve İki Konferans*, trans. Alp Tümertekin and Nihat Ülner, Janus Press, İstanbul 2015, p. 84.

the essence of architecture, depicts the world of architectural forms as a world that is conditioned by and born from material, and defines 'knitting' or 'knot' as the oldest technique. Semper takes the original meaning of the technique as the 'essence of the wall', and according to him, partition walls have evolved from walls made of straw to walls constructed of terracotta or cut stone[55]. While dry masonry becomes the basic structural unit of architectural action that manifests in different forms such as body, surface, or wall, it also becomes the frame of the building and the constituent element of the structural system. This system can be made of wood, stone and metal and the elements can be attached together in a variety of ways. While the material is the guide in the selection of the construction technique and in the processing of the building components, the structure increases the suitability and efficiency of the chosen system[56]. According to Sekler, in this regard, the structure and construction in each architectural form must support each other during the building process; that is the interaction between structure and construction constitutes the tectonics of the structure. Structure, which is an abstract concept, becomes realized by construction and gains visual expression through tectonics[57].

As Semper[58] points out, the design of the architectural object stems from the requirement to meet a concrete need, primarily to protect and shelter against climate and other threats. All such constructions and structures must comply with static and mechanical principles, that is to say, the laws of nature when forming their own forms, since such protection can be achieved by combining the solid materials provided by nature. Taken together, what Frampton, Semper and Sekler discuss defines exactly the nature of bee houses. Bee houses are shelters built for the protection of beehives and honey and are constructed with materials provided by nature. In places where stone is abundant, stone and wood are brought together, and if available, trees themselves are utilized, without using stone. Although rubble is generally used, the materials are left as they are in cases when they cannot be broken or where wood cannot be processed. Frampton describes such combination of materials with the term 'tectonic syntax'. The term is used in the sense that the technical loads of the structure are arranged through appropriate

55 Semper, *ibid*, p. 87.

56 Eduard Franz Sekler, *Structure, Construction and Tectonics*, 1965, p. 89

57 Sekler, *ibid*, p. 92.

58 Semper, *ibid*, p.133.

transitions and combinations respectively[59]. The bee house demonstrates the logic of the tectonic syntax at different levels, from the combination of different materials to the sequential distribution of loads among elements. The combination of stone and wood brought together in a system of repetitions that are used together to form a structure creates the tectonic syntax of the bee house.

Syntax as the science of the rules of joining and linking elements, covers all the rules that need to be known in order to construct a sentence from individual words, building parts or buildings that can function from individual elements[60]. The construction of a building can be described as the gradual integration of the structural elements. Different materials are brought together to form parts of the building, then these parts are jointed to each other, thus completing the entire structure of the building. Understanding how the structural elements are brought together, on the other hand, is not enough to comprehend the entire structural construct of a building. This is what Fischer calls 'constructive syntax' [61]. The togetherness of a construction from a static point of view is explained by structure and constructive syntax, while tectonic syntax refers to their compatibility with each other and with the environment. In the case of bee houses connecting such materials as stone, rubble or raw, wood as processed or in raw form, or formation and integration of eaves, cantilever stairs and roofs form the constructive syntax.

The tectonic syntax of a bee house is formed by the combination and perpetuation of a base and an upper structure, the body, with appropriate materials and details (Fig. 1). Starting from the base, the stones (with no use of mortar) and wooden beams (*hatıl*) are applied at a certain sequence; if there is a small opening, the system is supported by thicker wooden lintels to distribute and transfer the load. The main mass, that is, the body (*gövde*) is formed as such. With this intervention the structure under construction transforms from becoming a solid mass into an articulated one, and thus also acquires a spatial continuity. Fischer describes this as the 'flowing space syntax'[62]. According to Fisher, in this respect, a window in a wall does not create a break in the continuity of the object, because the continuity is maintained by the lintel or parapet wall.

59 Frampton, *ibid*, p. 28.

60 Günter Fischer, *Mimarlık ve Dil*, Daimon Yayınları, İstanbul 2015, p. 58.

61 Fischer, *ibid*, p. 59, 78.

62 Fischer, *ibid*, p. 72.

When the main body is formed, the beams placed in between the stones are superimposed on each other and made stronger by jutting them out at the corners. The eaves which are made to protrude from all sides of the main body provide a larger space to stack hives and to prevent wild animals from climbing on the structure. The eaves are also constructed from wooden beams (*düver*), which carry the maximum amount of the load and transfer it to the main body. These beams differ from the main beams (*hatıl*) in terms of dimension and are a complimentary component of the load-bearing system of the superstructure. They are placed so as to intertwine with the stones since they act together as the main support of the roof and the main structure that transfers the load to the base. The wooden elements used to carry the eaves which protrude from the body about its half size along the perimeters are placed in their solid and raw form with almost no processing. By placing the *düvers* in this way, the building gains an original character and a silhouette. In the constructional sequence, the thinner timber flooring beams (*drava*) are lined up in the opposite direction. The last element in the structural construct is the wooden flooring which is built on top of the *dravas* and composed of wooden planks that are laid in the opposite direction of the *dravas*. The wooden floor constructed as such, thus provides an elevated floor on which the hives can be placed. The way to combine all wooden materials is the most important aspect of the construct in terms of making the load gradually transfer from the main body to the base. A small opening left at a certain height on the main body, enables access to the inner part of the body and from there to the wooden platform. In order to reach this entrance, steps that form a console staircase are created by protruding the elements that function to connect the wooden beams used in the building in a perpendicular way, from the main body. The platform is used to place as many hives as possible, both side-by-side and on top of each other, the configuration of which is determined according to the stack capacity of the cylindrical hives. In order to protect the hives and bees from climatic conditions and adverse environmental factors, solutions are produced with the materials offered by nature and a constructive continuity is established throughout the structure. To provide thermal insulation, the spaces between the hives and their tops are plastered with bark or straw mixed mud, and the hive cluster is covered and insulated by using different materials such as bark or metal sheet. Water which is used by the bees to balance the temperature of the hives is an environmental and functional necessity. If there is no water available for the use of the bees in the near proximity, it was supplied by the owners of the bee hoses in terracotta containers which are placed on the platform where the hives are placed.

There is a similar hierarchical order in the hive, and the bee's use of the hive as a house is in harmony with that order[63]. In the process of making honey, the bee first circulates around the flowers, and then expresses in what direction the food source is rich in the form of a dance performed in front of the beehive. Upon arrival at the hives the bee rests for a while on the little platform found at the mouth of the hive (*işlengeç*) and then enters inside to start/continue producing the honey[64].

Undoubtedly, there are bee houses that differ in their tectonic constructs; where, the superstructure and main bodies are constructed differently, for which Antalya examples can be given[65]. However, it is observed that the typological differences seen in the architecture of bee houses can be defined mainly by how the body is constructed (Figures 7, 8, 9).

Conclusion

In light of the bee houses examined in rural Konya, it is observed that they are, like all rural architectural elements, made of local materials and meet the needs of their owners in an efficient way. The architecture varies according to the nature and shape of the main body that acts as a base. The first type is built as an extension of an existing tree trunk that serves as a body to raise the hives on a wide platform which is fixed to the trunk. The second type is in the form of an independent structure built on a vertical body constructed with stone and wood. Tectonically, the body is vertically constructed to function just like a tree trunk; the wooden platform is framed on this body. The body is built as a solid structure, with or without opening. The bee houses built on stone platforms constitute the

63 The colony consists of a queen bee, several hundred male bees, and 10,000 to 80,000 worker bees. The worker bees do all the work in the hive: producing honey, the nutrients of the offspring (bee bread), royal jelly, beeswax; building honeycomb eyes; carrying pollen, propolis and water to the hive; feeding larvae, queen and the male bees, and cleaning and protecting the hives. The queen bee provides the reproduction and continuity of the colony by laying eggs. Male bees fertilize only the queen bee, and then die. The queen bee and the working bees are female and have needles. Worker bees are very similar in appearance; despite this similarity, any foreign bee entering the hive is immediately recognized and thrown out or killed. Each hive has its own smell (Özlem Kılıç Ekici, "Balarısı (Apis mellifera)", Poster, *Bilim ve Teknik Aylık Popüler Dergisi*, S. 554, Ocak 2014.)

64 *İşlengeç* is the small platform in front of a beehive, which allows the bee to enter and exit the hive easily and also to rest.

65 Author.

third group. All three types are also found in the Antalya basin[66] (Figures 8, 9). Although the construction techniques and the arrangement of the hives vary in both regions (Figures 10-11), the resulting product is the same; while form differs, the tectonic constructs and syntax of the bee houses surveyed in both regions, which are determined by factors such as climate, vegetation, topography, the presence of natural physical elements (existing trees, rocks, etc.), and accessibility of building materials, are designed to provide space and privacy to bees and protect, keep and collect honey as their production.

Bee houses represent a tectonic syntax of the bond between stone and wood, consistent with environmental data. They embody a kind of a symbiotic relationship that operates and is meaningful between the bees, as the users of building, the humans as the builders of building and the environment as the material supplier of building. Bee houses are constructed to preserve and protect the spaces in which the users transform what they directly feed and collect from the environment into a product, in other words, to accommodate the beehives to produce honey. From this point of view, as Erzen[67] states, bee houses embody a meaning that is beyond being a structure that provides shelter and organizes honey production in the rural geography:

> ….. No qualitative expression is possible without a second entity that watches, presents its own body as a touchstone and perceives. The song of the bird, the blue of the sky and all the greens of the world are expressions of this awareness.

In this sense, observing the bee flying around from flower to flower during the honey making process, the dance it performs in front of the hive, the arrangement of hives by human hands as another actor in the process, raising the hives from the ground fosters an "aesthetic perception". The perception is a multidimensional relationship that one establishes with the environment, while aesthetic is the perception of all beings and formal qualities in this environment[68].

Apiculture is increasingly being performed in industrialized artificial environments or by using simple wooden boxes, indicating that this element will soon vanish in the rural environment of Anatolia. Being one of the rare types of buildings that have historical continuity as old as the settlement history, rural bee houses

66 For bee houses in Antalya see (Bulut, *ibid*, 2015; Author).

67 Jale Nejdet Erzen, *Çevre Estetiği*, ODTÜ Yayıncılık, Ankara 2006.

68 Erzen, *ibid,* p. 38.

are representatives of a unique tectonic construct, that serves both as a shelter and also a 'building'. The bee houses inherit a recognized and historical role in maintaining not only the natural production cycle of the rural landscape and its identity, but also the permanent memory of the local culture, that is rapidly disappearing today.

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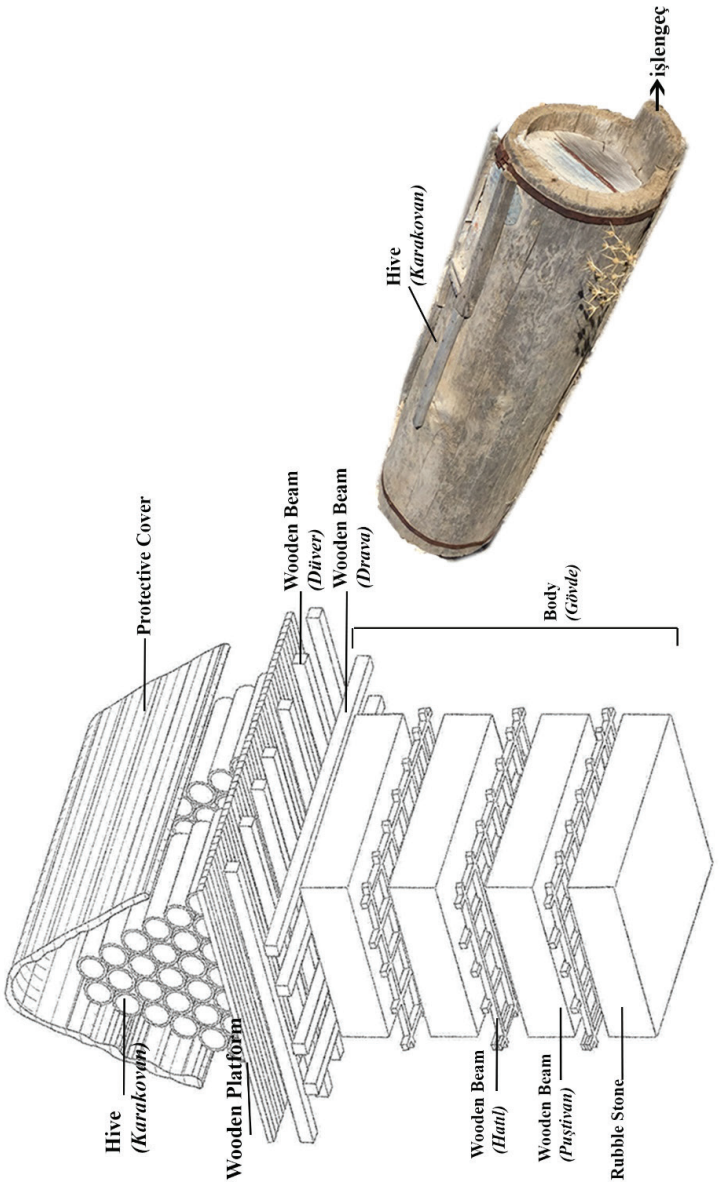
FIGURES



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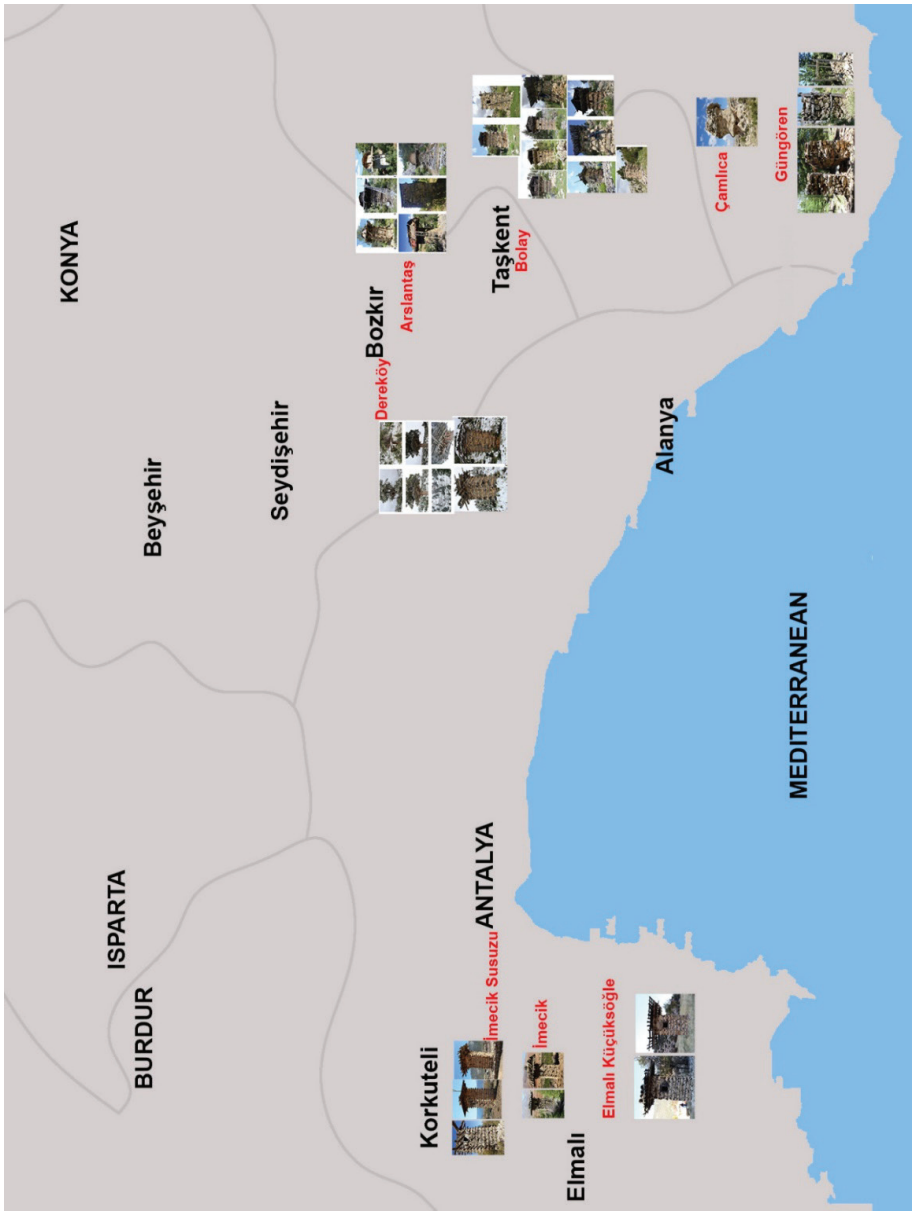

Figure 2
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a. Dereköy, Bozkır District
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Figure 3
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Figure 4
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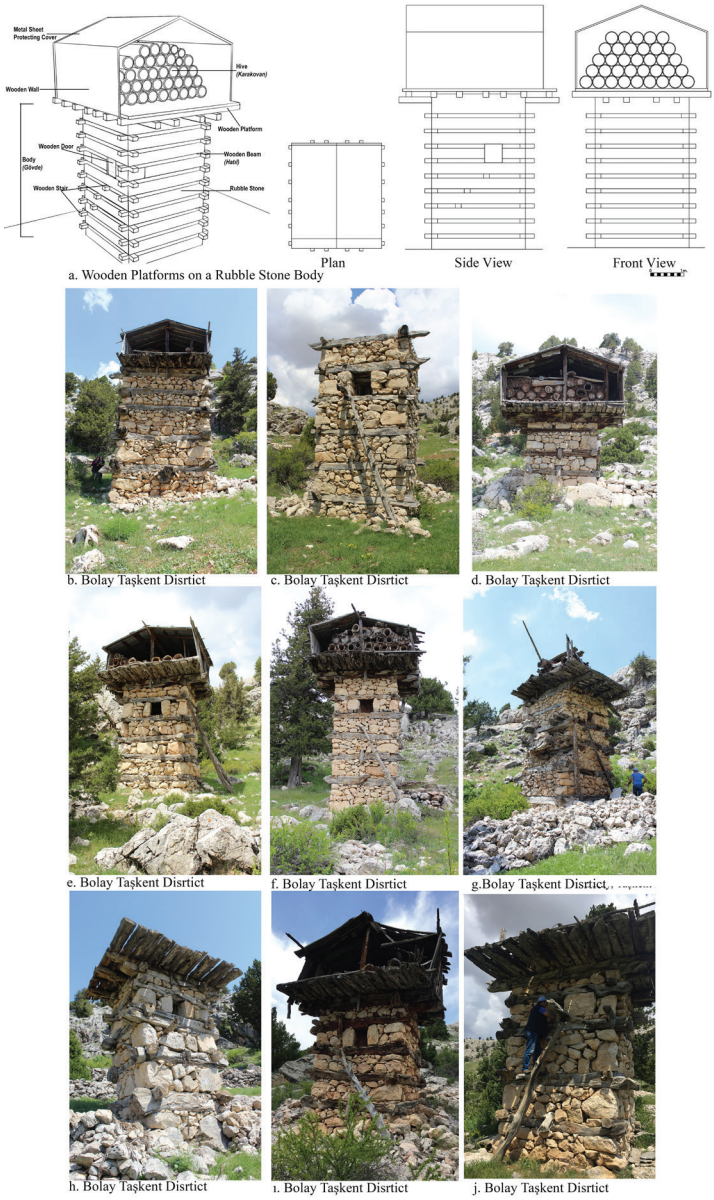

Figure 5
Source: Authors

a. Arslantaş Village, Bozkır District

b. Arslantaş Village, Bozkır District

Figure 6
Source: Authors

a. Küçüksöğle-Avdancık,Elmalı District b. Küçüksöğle-Avdancık,Elmalı District c. İmecik, Korkuetli District

d. İmecik, Korkuetli District e. İmecik Susuzu, Korkuetli District f. İmecik Susuzu, Korkuetli District

Figure 7
Source: Authors

a. Güngören,Anamur-Gazipaşa District

b. Güngören,Anamur-Gazipaşa District

c. Güngören,Anamur-Gazipaşa District

d. Çamlıca, Gazipaşa District

Figure 8
Source: Authors

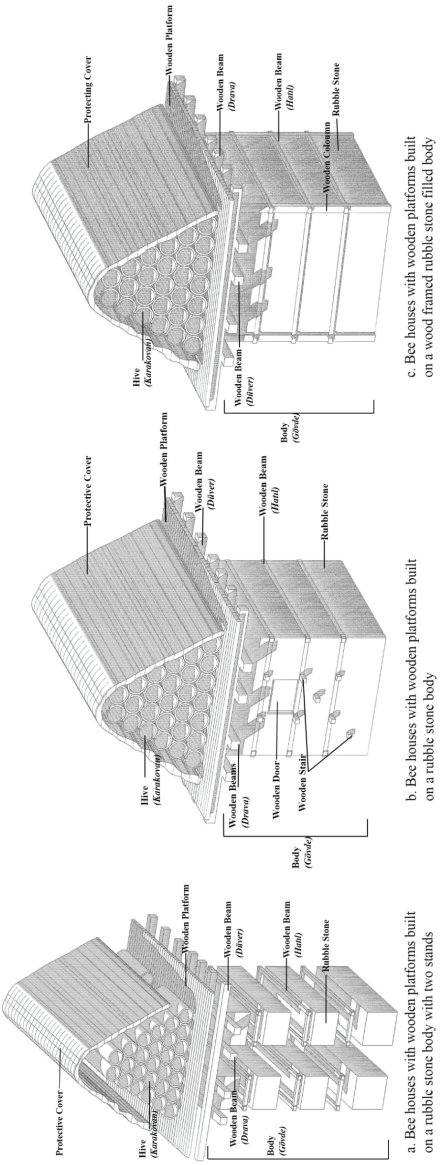

Figure 9
Source: Authors

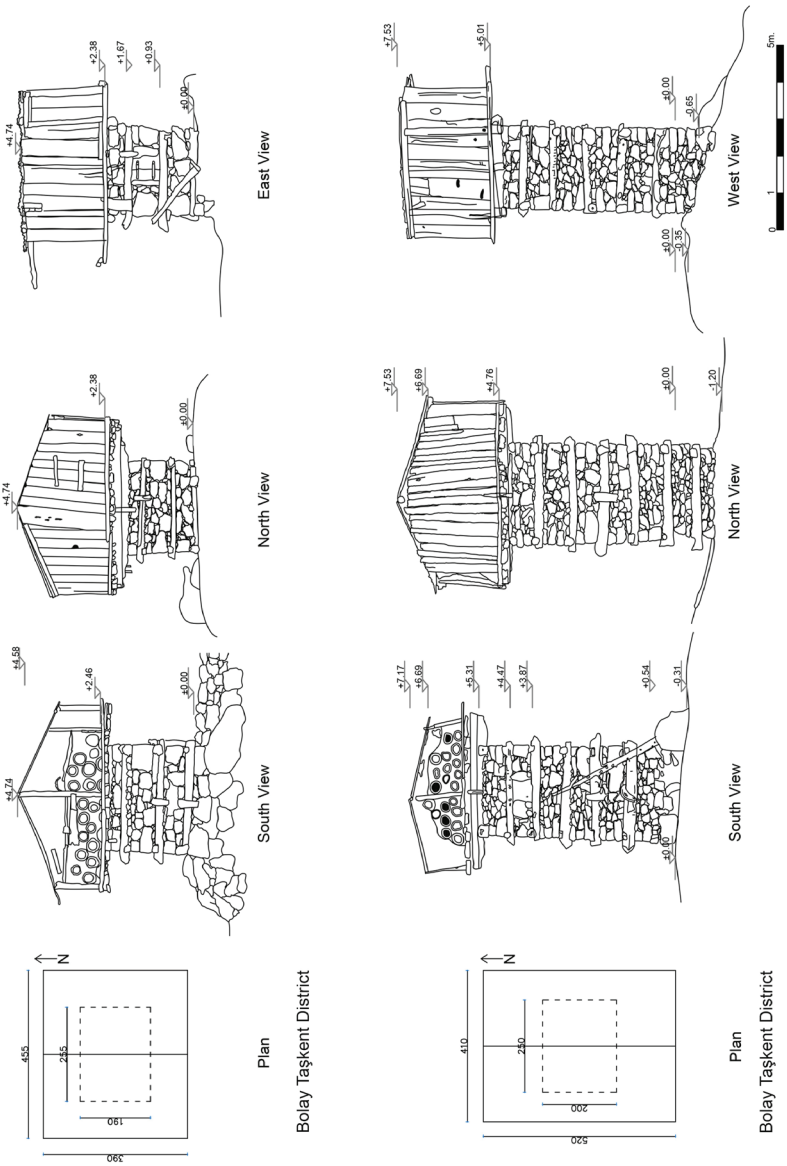

Figure 10
Source: Authors

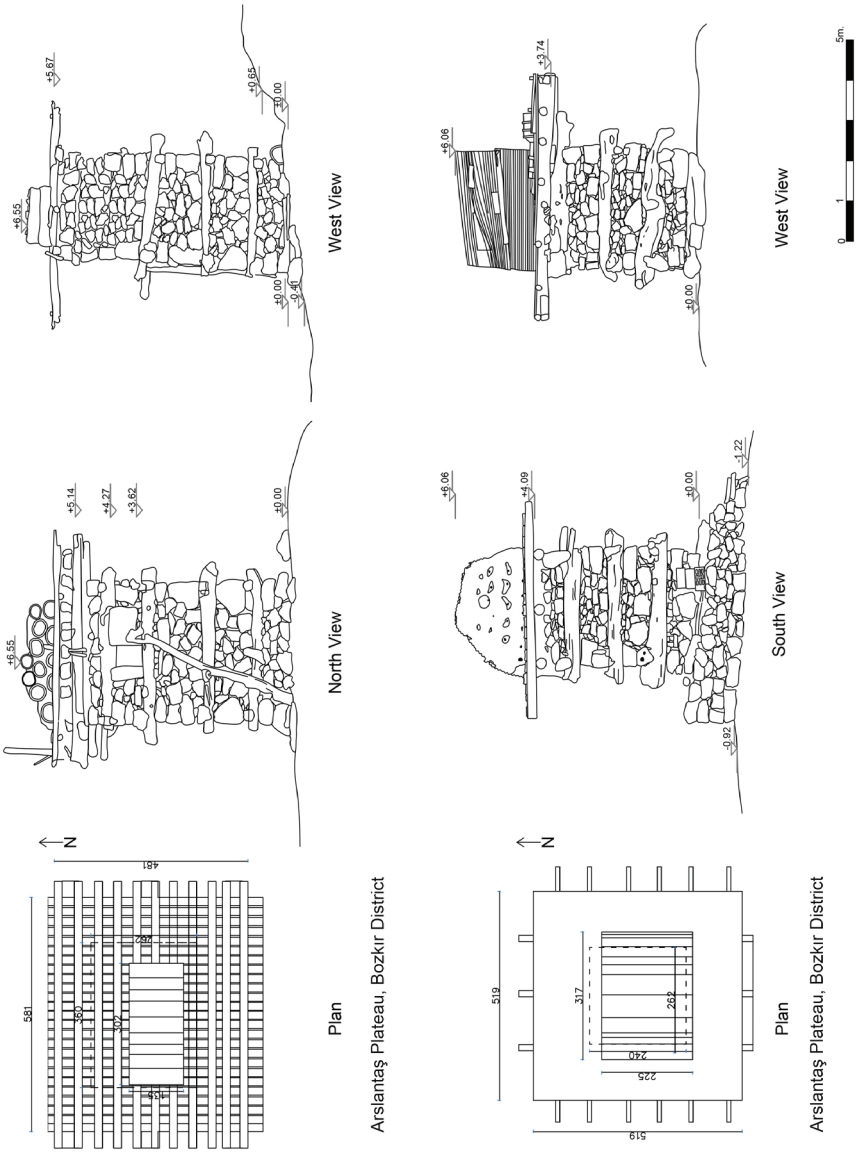

Figure 11
Source: Authors