A Research on Lugged Axes in the Light of the Sample in the Bilecik Museum

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[The purpose of this work is to offer, in light of a lugged axe sample preserved in Bilecik Museum in Türkiye, a general evaluation about the etymology, terminology, forms, decorations, materials and techniques of production, origins, geographical distribution, moulds, production sites, typology, types of haft attachment, functions, and datings of these axe types, and make new suggestions on the subject by pinning down the previous contradictive and problematic suggestions. The small and decorated axehead suggests that it was not suitable for woodworking activities. Its form and engravements conjure up the idea that it might have been used as a weapon. Considering that most of the lugged axes were found in unstratified, and those obtained from stratified are typologically different, it can be stated that the previous typological classifications of the lugged type do not amount to much when it comes to the chronological development of axes, at least for the time being. However, it seems crucial to attempt a typology, at least for the samples with clear differences, considering the idea that bear significant results concerning the geographical distribution and origin of the material. Considering the typological properties of the Bilecik Museum axe, it can be said to show parallelism with the negatives of the moulds found in Alacahöyük-Çorum, Hacıbektaş-Suluca, Karahöyük-Nevşehir, Soli Pompeipolis-Mersin, and particularly, Kültepe-Kayseri. In light of its formal characteristics, it is possible to suggest that the relevant axe was made in a Central Anatolian site. And, taking the parallel samples into consideration, it is possible to date the axehead preserved in Bilecik Museum to the first half of the 2nd Millennium B.C.]

Keywords: Bilecik Museum, Lugged Axe, Typology, Weapon, 2nd Millennium B.C.

1. *Introduction*

There are some essential tools that significantly helped the human species to reach its current cultural level and continue its existence. And the axe was one of the first and foremost tools particularly necessary for obtaining the basic needs, such as food, shelter, and defence.[1] It has

1. Coghlan 1943: 27, 29. Throughout ancient history, in addition to the axe's basic functions –such as lumbering and weaponry– it was used in hunting and butchery; in religious contexts such as rituals, offerings and burials; in social concept such as status and prestige; and in commercial contexts such as trade-off, weight measurement unit and currency

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remained important until today, especially in rural areas, despite partly losing its significance in daily life over time with the invention of new tools to serve some of its functions more efficiently in parallel with technological developments. At this point, we must mention that axes came in different types throughout history, one of them being the lugged axe that had left its mark in the 2nd Millennium B.C.

While selecting the lugged axe preserved in Bilecik Museum in Türkiye as the subject of this work, we set two main aims: The first one is to introduce this special axe to the world of science with its rarely-seen miniature form and decorations. And the second one is to present an evaluative summary of each and every data/suggestion on the etymology, terminology, forms, decorations, materials and techniques of production, origins, geographical distribution, moulds, production sites, typology, types of haft attachment, functions, and datings of lugged axes in light of the sample of Bilecik Museum, since it is clear that the preexisting data and suggestions in the literature concerning these types of axes are quite contradictive, making it hard to reach consensus on many an issue. And while carrying out the relevant evaluations, we also establish which of the contradictive suggestions are more plausible, or set forth new suggestions.

The said lugged axehead is registered in the inventory of Bilecik Museum under Museum Inventory Number a-1021. It was transferred from the Söğüt Museum Directorate in 25.12.2009. The 11.4 cm-long, 5.8 cm-wide and 0.7 cm-thick axe weighs 196.86 g. It is complete and well-preserved (figs. 1-3).

2. *Etymology and Terminology*

There is no preexisting data on the original name of this axe type. However, it is known that *Ateš* and *Šummittant* were the standard terms for "axe".[2] In modern literature, the highest number of publications about lugged axes are in Turkish, English, and German languages. In this context, the term *Kolcuklu Balta*[3] is predominantly used in Turkish while *Kolcuklu Yassı Balta*,[4] *Kanatlı Balta*[5] and *Bronz El Baltası*[6] are some of the other names that can be opted for. Many different names refer to this axe type in the English language, such as the *Lugged Axe*,[7] *Lugged Flat Axe*,[8] *Lugged Axe*/*Adze*,[9] *Lugged-Adze*,[10] *Lug Adze/Adze with Lugs*,[11] *Flat Axe with Side Projections*,[12]

(Risch et al. 2024: 11; Klimscha 2024: 47-48, 52, 55-56, 58-59, 61; Sheridan 2024: 201-202, 204-205, 207-209, 212, 214-216, 218-220; Rodríguez-Rellán – Valcarce 2024: 253, 261; Dolfini 2024: 336-337, 339; Melheim 2024: 403-466.).

2. Boehmer 1972: 37.

3. Ökse – Toy 1992: 136-138; Bilgi 1994: 255-257, 266-267, tab. 57. fig. 5; Yıldırım 2001: 127, 130, figs. 6-7, tab. 2a-b; Oyman 2003: 36; Süel – Süel 2004: 231, fig. 8; Berkcan 2006: 109; Seeher 2007: fig. 3; Yıldırım 2011: 117; Özkalalı-Ekmen 2012: 102; Çetin 2015: 115-121, 134-135; Erdem 2015: 6; Tekin 2018: 83; Akgül 2019: 87, fig. 49a; Ateş 2019: 6, 92-94, 111, cat. nos. 97-118; Yağcı 2019: 161, cat. no. 07. tab. IV. ill. 1, tab. XXVII. fig. 1; Yiğitpaşa – Yağcı 2020: 531-541; Çakır 2021: 36; Erdoğdu 2021: 3, 140-145, 163, cat. nos. 53-56; Yiğitpaşa – Çakır 2021: 388-389, cat. no. 10, fig. 10; Yiğitpaşa – Çakır 2022: 234-235, cat. no. 7-9, fig. 7-9; Keskin – Yıldız 2022: 121-146.

4. Bilgi 2001a: 8-9, 68, 70; Bilgi 2001b: 3-5; Bilgi 2004: 75, L/U 15.5; Akdeniz – Karaca 2004: 51-66.

5. Esin 1973: fig. 24.

6. Çoban 2013: 144, fig. 3.

7. Yadin 1957: 122, tab. 32.B; Muscarella 1988: 412, no. 566.

8. Mellaart – Murray 1995: 115.

9. Maxwell-Hyslop 1953: 69.

Trunnion Axe,[13] and *Trunnion Axe*/*Adze*.[14] *Ärmchenbeile*[15] is the standard term for it in the German language. Furthermore, this tool can be referred to as the *adze*[16] or the *axe*/*adze*[17] in some publications, although it is generally recognized as a type of *axe*.[18] We will prefer the term "lugged axe" throughout this work in accordance with the general use.

3. *Form*

The head of the lugged axe comprises three parts: 1) the male socket/neck/butt/upper part/upper body, 2) lugs, and 3) the barrel/blade (fig. 3). The sample of Bilecik Museum has a quadrangular male socket. It widens slightly towards its lugs on the bottom, drawing near to gaining a trapezoidal form. The lugs separate the male socket from the barrel.[19] These lugs come in many different shapes and forms. When it comes to the sample of Bilecik Museum, its lugs are distinctively protruding and slightly curved upwards. Barrels of lugged axes also come in different shapes and forms. Barrel of the Bilecik Museum sample has a convex tip and is concave on the sides.

4. *Decorations*

In view of the literature analysis, it was noticed that a variety of motifs had been engraved on a limited number of samples. The majority of the engraved motifs are floral or geometric patterns like those on the sample from Bilecik Museum. Other samples bearing impressions like royal seals,[20] inscriptions,[21] and engravings of figurative scenes[22] were also found.

One face of the Bilecik Museum sample was decorated by use of the engraving technique. Consisting of three different patterns, the decoration is located on the barrel, between the lugs. The first pattern comprises three amorphous semicircles engraved horizontally between the lugs, ending on a straight line below. The second pattern is a sequence of zigzags, also engraved between the

10. Siegelová – Tsumoto 2011: fig. 4.7.

11. Petrie 1917: 17-18, tab. XVII.93, XVIII.94-122.

12. Puglisi 1964: 43-44, 46, fig. 3.

13. Gordon 1951: fig. 2; D'Onofrio 2011: 660.

14. Stoyanov 2010: 406.

15. Boehmer 1972: 37; Bittel et al. 1975: 228; Erkanal 1977: 3; Hansen 2005: 90.

16. Bilinkenberg – Kinch 1931: 68; Rabinovich 2016: 40.

17. Rabinovich 2016: 39-40, tab. 4, fig. 2; Stoyanov 2010: 406.

18. Oğuz 1933: 53-54, 59, ill. 53-e-1242a, 1590; Esin 1973: fig. 24; Yıldırım 2001: 127, 130, figs. 6-7, tab. 2a-b; Seeher 2007: fig. 3; Özkalalı-Ekmen 2012: 102-106, 198-199, 206, cat. nos. 013-014; Erdem 2015: 6, 34-35, 102, 133, 147, 149, 175, tab. 5, 7, 9, 13; Akgül 2019: 84-85, 87.

19. Dullo 1936: 91-92; Gordon 1951: 47; Erkanal 1977: 3; Muscarella 1988: 412, no. 566; Özkalalı-Ekmen 2012: 102; Çetin 2015: 115; Erdem 2015: 102; Tekin 2018: 83; Yağcı 2019: 52; Yiğitpaşa – Yağcı 2020: 532; Çakır 2021: 36; Yiğitpaşa – Çakır 2021: 388; Yiğitpaşa – Çakır 2022: 234; Keskin – Yıldız 2022: 124.

20. Erkanal 1977: 3-4, tab. 1.7, 1.9; Bilgi 2004: 80, L/U 12.5; Berkcan 2006: 109, tab. 22.3, 22.5; Choi 2022: 43, tab. 18:84.

21. Süel – Süel 2004: 231, fig. 8.

22. Dullo 1936: fig. 9.15.

lugs horizontally. The third one is a vertical sequence of ∧ shape with a straight vertical line running downwards the center of the sequence. This pattern resembles a tree branch (figs. 1-3).

Taken as a whole, this pattern does not have any known parallels. Moreover, no patterns similar to the first pattern consisting of semicircles could be found either. However, it was possible to identify axes engraved with both the zigzag and the tree branch motifs. Samples with engraving/s of horizontal zigzag sequence/s between their lugs can be seen in Acemhöyük,[23] Bolu,[24] Karahöyük,[25] Kayseri,[26] Kültepe,[27] and the Swedish History Museum in Stockholm.[28] A limited number of axes with branch engravings were found in Acemhöyük,[29] Göynücek-Amasya,[30] and Byblos.[31] The branch motif engraved on the barrel of the Amasya axe somehow differs from the Bilecik Museum sample, as the Amasya sample has straight vertical lines engraved on both the center and the sides. Furthermore, the V-shaped sequence that constitutes the motif widens towards the lugs in a different direction. As for the Byblos sample, its pattern begins at the end of the male socket and extends until the beginning point of the barrel, as distinct from the Bilecik Museum sample. Still, the sequence of the V shapes making up the motif looks similar to the Bilecik Museum pattern with its central vertical line. And the Acemhöyük lugged axe has a sequence of < shapes with a central line, a horizontal zigzag sequence, and a sequence of V shapes constituting the branch motif engraved on it. There are two significant characteristics that distinguish the V sequence of this branch motif from that of the Bilecik Museum sample: First, it was engraved on the male socket, not the barrel, and second, the V sequence does not have any engravings of a central line.

5. *Materials*

Generally, bronze[32] is the common material of production when it comes to lugged axes, as is the sample preserved in Bilecik Museum. Still, the existence of copper,[33] iron,[34] and stone[35] axes is also known, although rare.

23. Erkanal 1977: 3-4, tab. 1.8; Akyurt 1998: 135, ill. 112c; Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 103, 206, cat. no. 013; Demirtaş 2018: 67.

24. Przeworski 1935: 413-414; Maxwell-Hyslop 1953: fig. 4.4; Erkanal 1977: 7, tab. 4.49.

25. Maxwell-Hyslop 1953: fig. 4.10; Erkanal 1977: 4.

26. Przeworski 1935: 413-414; Maxwell-Hyslop 1953: fig. 4.5; Erkanal 1977: 3-4, tab. 1.6; Akdeniz – Karaca 2004: 53; Berkcan 2006: 109, tab. 22.6.

26. Przeworski 1935: 414.

27. Przeworski 1935: 413-414; Erkanal 1977: 6, tab. 3.32; Yıldırım 2011: 117, fig. 4.

28. Przeworski 1935: 413-414, tab. L.a; Erkanal 1977: 3-4, tab. 1.10; Berkcan 2006: 109, tab. 22.7. Although the place of origin cannot be determined with certainty, it is thought that it may have originated from the Near East or Asia Minor.

29. Erkanal 1977: 3-4, tab. 1.8; Akyurt 1998: 135, ill. 112c; Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 103, 206, cat. no. 013; Demirtaş 2018: 67.

30. Bilgi 2001b: 23-24, ill. 78-79, fig. 47.

31. Ateş 2019: cat. no. 103.

32. Oğuz 1933: 59, ill. 53-e-1590; Seeher 2007: fig. 3; Erdem 2015: 6, 34-35, 102, 133, 147, 149, 175, tab. 5, 7, 9, 13; Özkalalı-Ekmen 2012: 206, cat. nos. 013-014. Yıldırım 2001: 127, 130, figs. 6-7, tab. 2a-b. Berkcan 2006: 171; Yıldırım 2011: 283, no. 273; Ökse – Toy 1992: 136-138; Çoban 2013: 144, fig. 3; Çakır 2021: cat. nos. 23-28; Süel – Süel 2004: 231, fig. 8; Çetin 2015: 115-121, 134-135; Yağcı 2019: 161, cat. no. 07. tab. IV. ill. 1, tab. XXVII. fig. 1;

6. *Origins*

It is quite hard to display the formal changes of axes chronologically. However, it can be remarked that techniques and types of axe production went hand in hand with the development of the axe.[36] Despite its resemblance to the flat axe type, the lugged axe has protruding points on both sides.[37] Therefore it can be said that the lugged axe represents a more evolved version of the flat axe with the addition of lugs.[38] In other words, the ongoing flat axe production transformed over time not only in terms of form, but also technically in terms of the head's attachment to the haft. People sought to solve certain problems that had arisen during the utilization of axes, as the case was with other types of metal weapons. The most common problem with weapons that are attached to a handle or a haft is that this attachment may weaken or break upon heavy impact. Particularly when this impact is repeated frequently, the attachment, no matter how strong, inevitably becomes looser. In the beginning, the metal axe was attached to the haft with rope/leather, and it was fastened as tight as possible to withstand heavy impact. And the lugs located on both sides of the flat barrel enhanced the impact resistance of the metal axehead which was fixed into the slots carved onto the haft, reinforcing their connection with the rope/leather.[39] In such a combination, the lugs prevent the axe from budging, also increasing the steadiness of the rope/leather attachment.[40] But, with reference to these data, one must not think that the lugged axe was derived from the flat axe. The flat axe stayed in use for a very long time after the emergence of the lugged axe,[41] and even the negatives of both types were found on the very same moulds, indicating that the latter did not replace the former.[42] In brief, it can be remarked that the lugged axe was independently developed out of necessity pursuant to technological advancements, not necessarily playing any role in the evolutionary process of any other axe types.

7. *Geographical Distribution*

It is possible to come across lugged axes throughout quite an extensive geography. The well-known finding sites in Türkiye include Afyon Museum,[43] Alişar in Yozgat,[44] Acemhöyük in

Erdoğdu 2021: 3, 140-145, 163, cat. nos. 53-56; Muscarella 1988: 412, no. 566; Ateş 2019: 6, 92-94, 111, cat. no. 97-118; Yiğitpaşa – Çakır 2021: 388-389, cat. no. 10, fig. 10; Yiğitpaşa – Çakır 2022: 234-35, cat. no. 7-9, fig. 7-9.

33. Puglisi 1964: 43-44, 46, fig. 3.

34. Oğuz 1933: 59, ill. 53-e-1242a; Snodgrass 2000: 232-233, 235, tab. 84; Przeworski 1935: 410; Muhly et al. 1985: 78, tab. IX.b3.

35. Çetin 2015: 115.

36. Coghlan 1943: 38, 42.

37. Erdem 2015: 102.

38. Przeworski 1939: 31-32; Hestrin – Tadmor 1963: 266; Erkanal 1977: 3.

39. Przeworski 1939: 32; Coghlan 1943: 39, 42; Tekin 2018: 83; Yağcı 2019: 53; Yiğitpaşa – Yağcı 2020: 533.

40. Petrie 1917: 17; Dullo 1936: 88; Maxwell-Hyslop 1953: 71; Keskin – Yıldız 2022: 124, 131-132.

41. Keskin – Yıldız 2022: 131.

42. Müller-Karpe 1994: 143.

43. Keskin – Yıldız 2022: 134.

Aksaray,[45] Alacahöyük in Çorum,[46] Alaçam Pelit Bükü Village in Samsun,[47] Amasya and its surroundings,[48] Museum of Anatolian Civilizations in Ankara,[49] Arslantepe in Malatya,[50] Sariçi Site of Balıbağı Village in Çankırı,[51] Beycesultan in Denizli,[52] Boğazköy in Çorum,[53] Bolu and its surroundings,[54] Cape Gelidonya Shipwreck in Antalya,[55] Dündartepe in Samsun,[56] Eskiyapar in Çorum,[57] Gözlü Kule in Mersin,[58] Ilıpınar in Bursa,[59] Isparta Museum,[60] İkiztepe in Samsun,[61] İmikuşağı in Elazığ,[62] Karahöyük in Konya,[63] Kayseri and its surroundings,[64] Korucutepe in Elazığ,[65] Kozmandere Hoard in Tekirdağ,[66] Kültepe in Kayseri,[67] Mersin,[68] Muğla Museum,[69]

44. Oğuz 1933: 53-54, 59, ill. 53-e-1242a, 1590; Przeworski 1935: 409-410; Przeworski 1939: 31; Dullo 1936: fig. 8.5; von der Osten 1937a: 253, 261, 441, 444, figs. 286, 497; von der Osten 1937b: 110, 115, fig. 107; Gordon 1951: 47, fig. 2.5, 12; Maxwell-Hyslop 1953: figs. 4.3, 14, 20, 5.25-26, 6.8; Akdeniz – Karaca 2004: 53; Demirtaş 2018: 67.

45. Akdeniz – Karaca 2004: 53; Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 102-6, 198-199, 206, cat. nos. 013-014; Demirtaş 2018: 67.

46. Koşay – Akok 1966: 77, tab. 47. A1.1 18, A1.1 60; Macqueen 2001: 66, no. 31; Akdeniz – Karaca 2004: 53.

47. Müller-Karpe 1994: 227, tab. 64.1; Berkcan 2006: tab. 22.10.

48. Bilgi 2001b: 23-24, ills. 67-68, 74-75, 78-79, 81-82, 85, figs. 44, 47; Bilgi 2004: 80, L/U 18.2; Akdeniz – Karaca 2004: 54.

49. Yıldırım 2011: 283, no. 273.

50. Puglisi 1964: 43-44, 46, fig. 3.

51. Süel 1989: 145, 147, 150, 155, ill. 5.B1.Bg/9; Demirtaş 2018: 68.

52. Mellaart – Murray 1995: 114-117, 129-132, 135, 153-156, 160, figs. O2, O4, O6, O10, tab. IX. a-b; Akdeniz – Karaca 2004: 53; Erdem 2015: 6, 34-35, 102, 133, 147, 149, 175, tab. 5, 7, 9, 13.

53. Przeworski 1935: 409, fig. 1.0; Przeworski 1939: 31; Dullo 1936: figs. 8.3, 8; Gordon 1951: 47, fig. 2.7; Maxwell-Hyslop 1953: figs. 4.6, 11, 19, 21, 5.16, 24; Boehmer 1972: 37-38, tab. II, Bl. 23-24, 26-27; Bittel et al. 1975: 229, figs. 131a-b; Akdeniz – Karaca 2004: 53; Seeher 2007: 29, fig. 3.

54. Przeworski 1935: 410; Przeworski 1939: 31; Maxwell-Hyslop 1953: fig. 4.4; Yıldırım 2001: 127, 130, figs. 6-7, tab. 2a-b; Akdeniz – Karaca 2004: 53; Berkcan 2006: tab. 22.8.

55. Bass 1961: 267, 273, 275-276, fig. 25; Erkanal 1977: 12.

56. Lamb 1949: 200, fig. VII; Maxwell-Hyslop 1953: fig. 5.15; Bilgi 2001b: ill. 87.

57. Sipahi 2012: 3.

58. Goldman 1937: 271, fig. 19; Przeworski 1939: 31; Gordon 1951: 47, 58, fig. 2.3; Maxwell-Hyslop 1953: figs. 5.19-20; Erkanal 1977: 11; Oyman 2003: 129, 135-136, tab. VIIIa, XL.c; Akdeniz – Karaca 2004: 53.

59. Ayengin 1999: 21, fig. 9.

60. Çetin 2015: 115-121, 134-135.

61. Bilgi 1984: 47, fig. 14; Bilgi 2001b: 10; Bilgi 1990: 75, tab. 67. fig. 33; Akdeniz – Karaca 2004: 53.

62. Akdeniz – Karaca 2004: 53.

63. Dullo 1936: fig. 8.6; Maxwell-Hyslop 1953: fig. 5.21; Akdeniz – Karaca 2004: 53; Berkcan 2006: tab. 22.3; Choi 2022: 43, tab. 18:84.

64. Przeworski 1935: 409, tab. XLIX.a-d; Przeworski 1939: 31, tab. X.3-4; Dullo 1936: fig. 8.4, 7; Maxwell-Hyslop 1953: fig. 5.18; Akdeniz – Karaca 2004: 53; Berkcan 2006: tab. 22.6; Erdoğdu 2021: 3, 140-145, cat. nos. 53-56.

65. Akdeniz – Karaca 2004: 53.

66. Özdoğan 2002: 74, fig. 5; Hansen 2005: 90; Stoyanov 2010: 406.

67. Przeworski 1935: 409, fig. 1.b; Przeworski 1939: 31; Muscarella 1988: 412, no. 566; Akdeniz – Karaca 2004: 53; Berkcan 2006: tab. 22.2; Akgül 2019: 84-85, 87.

68. Gordon 1951: 47, fig. 2.4; Erkanal 1977: 11.

69. Keskin – Yıldız 2022: 121-146.

Müftüler Village in Yozgat,[70] Ordu and its surroundings,[71] Pirot Mound in Malatya,[72] Sadberk Hanım Museum in Istanbul,[73] Samsun and its surroundings,[74] Seyitömer Mound in Kütahya,[75] Sinop and its surroundings,[76] Sivas Museum,[77] Şapinuva in Çorum,[78] Tell el Cudeyde in Antakya,[79] Tepecik in Elazığ,[80] Tille Mound in Adıyaman,[81] Tokat Museum,[82] Troia in Çanakkale,[83] Uluburun Shipwreck in Antalya,[84] Yazılıkaya in Çorum,[85] and Yumuktepe in Mersin.[86] Apart from those, a large number of findings deemed to be of Anatolian origin, exact finding spots of which are unknown, are known to exist.[87] Lugged axes were also found in a number of countries located south of Türkiye, and one of them is Syria with its Caesarea Syria, Hama, Qatna, Ugarit, and Tell Afis.[88] In Israel, lugged axes were unearthed in Beit Shemesh, Beit She'an, Tel Gezer, Hazor, Khirbet el-Meshash, Khirbet Qeiyafa, Nahariyya, Tell Abu Hawam, Tel Megiddo, and Tell el-Far'ah.[89] Other finding sites include Gaza in Palestine,[90] Byblos in Lebanon,[91] and Ain Shams and

70. Berkcan 2006: tab. 22.5.

71. Przeworski 1935: tab. XLVII.a; Przeworski 1939: 31, tab. II.4; Dullo 1936: fig. 8.2; Yağcı 2019: 161, cat. no. 07. tab. IV. ill. 1, tab. XXVII. fig. 1; Yiğitpaşa – Yağcı 2020: 531-541.

72. Akdeniz – Karaca 2004: 51-66; Berkcan 2006: tab. 22.9.

73. Anlağan – Bilgi 1989: 41-42, 55-61; Akdeniz – Karaca 2004: 53.

74. Przeworski 1935: 410; Przeworski 1939: 31; Bilgi 2001a: 8-9, 68, 70, 102, 104, figs. 95 a1-a2, 109 a1-a2; Bilgi 2001b: 23-24, ill. 70-72, 83, figs. 45-46; Bilgi 1994: 255-257, 266-267, tab. 57. fig. 5; Bilgi 2004: 80, 95, L/U 12.9, L/U 11.4; Akdeniz – Karaca 2004: 54; Çakır 2021: cat. nos. 23-25; Yiğitpaşa – Çakır 2021: 388-389, cat. no. 10, fig. 10.

75. Bilgen 2011: 318, figs. 19, 309, 201, 319, 381-382, 444, 478-479; Bilgen 2013: 34, fig. 78.

76. Bilgi 2001b: 23-24, ill. 69, 76-77, 80; Akdeniz – Karaca 2004: 54; Çakır 2021: cat. nos. 26-28; Yiğitpaşa – Çakır 2022: 234-235, cat. no. 7-9, fig. 7-9.

77. Ökse – Toy 1992: 136-138; Akdeniz – Karaca 2004: 53.

78. Süel – Süel 2004: 231, fig. 8.

79. Maxwell-Hyslop 1953: fig. 4.2; Erkanal 1977: 11.

80. Esin 1973: fig. 24; Erkanal 1977: 11; Akdeniz – Karaca 2004: 53.

81. Mellink 1960: 63, fig. 5; Erkanal 1977: 11; French et al. 1982: 161.

82. Bilgi 2001b: 24, ill. 84, fig. 48; Akdeniz – Karaca 2004: 54; Çoban 2013: 144, fig. 3.

83. Gordon 1951: 47, fig. 2.13; Maxwell-Hyslop 1953: fig. 6.11.

84. Bass 1986: 269, 292, fig. III.32; Pulak 1988: 1, 14-16, fig. 11.

85. Przeworski 1939: 31.

86. Akdeniz – Karaca 2004: 53.

87. Bilinkenberg – Kinch 1931: 68; Przeworski 1935: 410; Gordon 1951: 47; Maxwell-Hyslop 1953: fig. 5.17; Muscarella 1988: 412, no. 566; Ökse – Toy 1992: 137; Berkcan 2006: tab. 22.7; Bryce 2007: 63; Çetin 2015: 115; Rabinovich 2016: 39; Yağcı 2019: 54; Keskin – Yıldız 2022: 124.

88. Petrie 1917: 17, tab. XVIII.111; Dullo 1936: fig. 8.16; Przeworski 1939: 31; Gordon 1951: 47, fig. 2.2; Maxwell-Hyslop 1953: figs. 4.1, 4.18, 6.4, 5.13-14, 6.6; Erkanal 1977: 11; Muscarella 1988: 412, no. 566; Ökse – Toy 1992: 137; Archi – Venturi 2012: 8, 19, 217, figs. 5a, 9; Özkalalı-Ekmen 2012: 102-103; Çetin 2015: 115; Ateş 2019: cat. nos. 97-102; Yağcı 2019: 54.

89. Dullo 1936: fig. 8.15; Przeworski 1939: 31; Gordon 1951: 47, fig. 2.1; Maxwell-Hyslop 1953: figs. 5.1-10, 12-13, 23, 27, 29; Yadin 1957: 122, tab. 32.B; Erkanal 1977: 11; Fritz 1981: 69, 97, fig. 14, tab. 12.D; Rabinovich 2016: 39-40, tab. 4, fig. 2; Ateş 2019: cat. nos. 105-106, 108-118.

90. Dullo 1936: fig. 8.14; Przeworski 1939: 31; Gordon 1951: 47; Maxwell-Hyslop 1953: fig. 5.28; Erkanal 1977: 11; Muscarella 1988: 412, no. 566; Ökse – Toy 1992: 137; Özkalalı-Ekmen 2012: 102-103; Çetin 2015: 115; Yağcı 2019: 54; Ateş 2019: cat. no. 107.

Gerzeh in Egypt.[92] Located east of Türkiye, Iran holds lugged axe findings in Amarat, Hasanlu, Khodja-Daoud Bridge, Lorestan, Solduz, Tureng Tepe, and the Talysh Region.[93] The lugged axe was also found in Pakistan (Shalozan),[94] India,[95] and even China.[96] As for Europe,[97] the Balkans,[98] Russia, and Transcaucasia,[99] these regions stand out with the existence of a considerable amount of lugged axes. Lugged axes were unearthed in Hallstatt, Hannover, Hesersleben, Saxony, and Ziesar in Germany;[100] Steiermark and Styria in Austria;[101] Bakurziche, Chodschali, Kedabeg, and Paradiesfestung in Azerbaijan;[102] in Bosnia;[103] in British Isles;[104] Krivodol, Markovo, Obrochishte, and Omarchevo in Bulgaria;[105] Blansko in Czech Republic; Vornak in Armenia;[106] Beshtasheni, Kvemo Sesirethi, Lecchum, Samthavro, and Zchinvali in Georgia;[107] Limerick in Ireland;[108] Spain;[109] Caltanisetta, Civitavecchia, Puzzuoli, Rovello Rome, Syracuse, Sardinia, Sicily, and Southern Italy in Italy;[110] Agios Iakovos and Enkomi in Cyprus;[111] in Hungary;[112] Silesia in Poland;[113] Birlad, Chernatu, and Sinsimion in Romania;[114] Pyatigorsk in Russia;[115] Kerch and

91. Erkanal 1977: 11; Ateş 2019: cat. nos. 103-104.

92. Petrie 1917: 17; Przeworski 1939: 31; Maxwell-Hyslop 1953: fig. 5.11, tab. VIII.3; Erkanal 1977: 11.

93. Petrie 1917: 17; Dullo 1936: fig. 8.10; Przeworski 1939: 31; Gordon 1951: 47-48, 56, figs. 2.6, 8-10; Maxwell-Hyslop 1953: figs. 6.1, 2, 5, 7, 9, tab. VIII.1; Muscarella 1988: 412, no. 566; Ökse – Toy 1992: 137; Özkalalı-Ekmen 2012: 102-103; Çetin 2015: 115; Yağcı 2019: 54.

94. Gordon 1950: 58, fig. 1.23; Maxwell-Hyslop 1953: fig. 6.12.

95. Przeworski 1939: 31; Sankalia 1963: 312; Ökse – Toy 1992: 137; Akdeniz – Karaca 2004: 54; Keskin – Yıldız 2022: 124.

96. Dullo 1936: 94; Przeworski 1936: 57, n. 1.

97. Keskin – Yıldız 2022: 124.

98. Çetin 2015: 115; Yağcı 2019: 54.

99. Dullo 1936: fig. 9.12; Przeworski 1939: 31; Çetin 2015: 115; Yağcı 2019: 54.

100. Petrie 1917: 17; Dullo 1936: figs. 9.13-14.

101. Petrie 1917: 17, tab. XVIII.113, 115.

102. Dullo 1936: figs. 9.1-2, 4, 8, 10.

103. Petrie 1917: 17; Bilinkenberg – Kinch 1931: 68.

104. Petrie 1917: 17.

105. Stoyanov 2010: figs. 1.1, 4-5, 7-8, 10-16.

106. Dullo 1936: figs. 9.9, 9.16.

107. Dullo 1936: figs. 9.3, 5-7, 11; Gordon 1951: 47-48, fig. 2.14; Maxwell-Hyslop 1953: fig. 6.3.

108. Petrie 1917: tab. XVIII.105, 119-120; Gordon 1951: 47.

109. Petrie 1917: tab. XVIII.99, 106; Maxwell-Hyslop 1953: fig. 6.14; Monteagudo 1977, 135-147, Taf. 50-55; Akdeniz – Karaca 2004: 54.

110. Petrie 1917: 17, tab. XVIII.95-97, 101, 103-104, 107-108, 112, 114; Maxwell-Hyslop 1953: figs. 3.3-6, tab. VIII.2.

111. Maxwell-Hyslop 1953: fig. 6.10; Erkanal 1977: 12; Özkalalı-Ekmen 2012: 102-103; Çetin 2015: 115; Yağcı 2019: 54.

112. Petrie 1917: 17, tab. XVIII.98; Bilinkenberg – Kinch 1931: 68; Gordon 1951: 47, fig. 2.11.

113. Petrie 1917: 17.

114. Stoyanov 2010: figs. 1.2-3, 6, 9.

115. Przeworski 1939: 31; Maxwell-Hyslop 1953: fig. 5.30; Erkanal 1977: 12.

Crimea in Ukraine;[116] and Amargos, Asine, Athens, Attika, Dodona, the Aegean Islands, Lefkandi, Lindos, Rhodes, Crete, and Hagia Triada in Greece[117] (fig. 4).

8. *Moulds, Production Sites and Technique*

Lugged axe moulds are found in Türkiye, Bulgaria, Iran, and Israel. These moulds were unearthed in a number of sites in Türkiye, namely Akçadağ in Malatya,[118] Alacahöyük in Çorum,[119] Alişar in Yozgat,[120] Beycesultan in Denizli,[121] Boğazköy in Çorum, Hacıbektaş-Suluca, Karahöyük in Nevşehir,[122] Gavur Castle in Ankara,[123] Korucutepe in Elazığ,[124] Kültepe in Kayseri,[125] Lidar Mound in Şanlıurfa,[126] Soli Pompeipolis in Mersin,[127] Seyitömer Mound in Kütahya,[128] and Troia in Çanakkale.[129] They were also found in Mogilitsa in Bulgaria,[130] Hasanlu[131] and Solduz[132] in Iran, and Gezer in Israel[133] (fig. 5). The moulds play a very significant role in finding the production sites of lugged axes because their existence proves that the axes were made on-site.[134] Both the number of moulds and the sites they were found in are considerably fewer than the number of axe findings and the sites they were found in. This indicates that the number of the production sites was limited, and the finished axes were distributed to a vast geography via several ways, especially by trade. As stated above, lugged axe moulds were found in Türkiye, Bulgaria, Iran, and Israel.[135]

116. Petrie 1917: 17, tab. XVIII.110; Dullo 1936: fig. 9.15; Maxwell-Hyslop 1953: fig. 4.12; Erkanal 1977: 11.

117. Petrie 1917: tab. XVIII.94, 109; Dullo 1936: figs. 8.11-13, 9.17; Przeworski 1939: 31; Bilinkenberg – Kinch 1931: 68, tab. 3.27; Maxwell-Hyslop 1953: figs. 3.1-2, 5.22; Erkanal 1977: 12; Ökse – Toy 1992: 137; Snodgrass 2000: 232-233, 235, tab. 84; D'Onofrio 2011: 649, 660-661, figs. 4, 9; Lloyd 2014: 196, tab. 6c; Çetin 2015: 115; Yağcı 2019: 54.

118. Müller-Karpe 1994: 205, tab. 34.4.

119. Koşay – Akok 1973: 27, tab. XLVI. A1.R.75; Müller-Karpe 1994: 199, 204, tab. 18.3, 19.4, 33.3; Akdeniz – Karaca 2004: 53.

120. Przeworski 1935: 410; Przeworski 1939: 31; Dullo 1936: 88, 91; von der Osten 1937b: 94, 96, fig. 91; Erkanal 1977: 6, 9, tab. 3.35; Müller-Karpe 1994: 204, tab. 32.3, 33.1, 34.1.

121. Müller-Karpe 1994: 144, 206, tab. 37.2; Mellaart – Murray 1995: tab. IX.b; Erdem 2015: 147, fig. 81.1.

122. Müller-Karpe 1994: 199, 204, tab. 19.2, 32.1-2.

123. Przeworski 1935: 410; Przeworski 1939: 32; Dullo 1936: 90-91; Müller-Karpe 1994: 205, tab. 34.5.

124. Müller-Karpe 1994: 204, tab. 34.3.

125. Dullo 1936: 88; Erkanal 1977: 3, 8, tab. 1.1-5; Müller-Karpe 1994: 144, 203-204, tab. 31.1-3, 33.2, 50.3; Akdeniz – Karaca 2004: 53; Bilgi 2004: 27, L/U 25; Berkcan 2006: 109. Gernez 2007: 112, ill. 149a.

126. Müller-Karpe 1994: 199, tab. 19.1.

127. Özkalalı-Ekmen 2012: 105; Yağcı – Kaya 2012: 173, fig. 7.

128. Ünan et al. 2024: 28, ill. 4A.; Özkalalı-Ekmen 2012: 105.

129. Przeworski 1935: 410-411; Przeworski 1939: 31, tab. VII.5; Dullo 1936: 90, fig. 8.9; Müller-Karpe 1994: 144, 199, 204, tab. 19.3, 33.4, 34.2.

130. Stoyanov 2010: 407.

131. Gordon 1951: 48; Maxwell-Hyslop 1953: 77; Muscarella 1988: 412, no. 566.

132. Gordon 1951: 47-48, fig. 2.10; Maxwell-Hyslop 1953: 77.

133. Dullo 1936: 91; Przeworski 1936: 53.

134. Przeworski 1939: 22.

135. It should be kept in mind that excavations to be carried out in the coming years may reveal moulds in other countries as well.

The fact that the mould of the lugged axe of Bilecik Museum was not found and the axe itself did not undergo any analyses renders it hard to make an absolute judgement about the technique or stages of production. However, it is still possible to make a suggestion about the production method and stages. It seems that the literature has virtually reached a consensus on that lugged axes were cast in single-piece stone moulds,[136] despite some exceptional suggestions concerning them having been cast in two-piece moulds.[137] In light of the presented evidence,[138] it can be said that a negative of the Bilecik Museum axe's form was carved onto a stone piece, and thus the axe mould was made. And then, molten bronze in liquid form was poured into the horizontally-placed mould. The top of the mould was closed with a lid in order to prevent fast setting and bubble formation during the casting process. After a while, the frozen axe took its basic form and was removed from the mould. It then underwent hammering, smoothing, and polishing processes to make it more functional for use. The patterns must finally have been engraved on the axe by use of a pointed tool.

When compared with the typologies of the negative forms on the above-mentioned moulds, the axe of Bilecik Museum is similar to the Hacıbektaş-Suluca, Karahöyük in Nevşehir,[139] Alacahöyük in Çorum,[140] and Soli Pompeipolis in Mersin[141] samples, and especially the Kültepe in Kayseri sample.[142] And, not only the previous suggestions in the literature, but also the large number of samples found in Kültepe indicate that Central Anatolia used to be an important region when it came to lugged axe production.[143] Therefore, the idea that the Bilecik Museum axe was made in a Central Anatolian site seems plausible in view of the existing data.

9. *Typology*

All of the axes that have lugs separating the male socket from the barrel are standardly defined as lugged axes. However, these axe types vary in details (i.e., the male socket, lugs, and barrel). Researchers have established typological classifications by taking these differences into consideration. In this context, Przeworski, Dullo, Maxwell-Hyslop, Deshayes, Erkanal, Bilgi, and lastly, Anlağan and Bilgi come to the forefront with their typological suggestions.

Przeworski considers the differences in the general forms and the male sockets of the axes with a particular focus on the shapes of the lugs, and thus suggests a typology consisting of five

136. Muscarella 1988: 412, no. 566; Yıldırım 2001: 130; Özkalalı-Ekmen 2012: 102; Rabinovich 2016: 39; Tekin 2018: 83; Demirtaş 2018: 67; Yağcı 2019: 51, 53; Yiğitpaşa – Yağcı 2020: 533-534; Çakır 2021: 36; Keskin – Yıldız 2022: 124.

137. Anlağan - Bilgi 1989: 41; Yağcı 2019: 53.

138. Muscarella 1988: 412, no. 566; Yıldırım 2001: 130; Anlağan – Bilgi 1989: 41; Özkalalı-Ekmen 2012: 102; Rabinovich 2016: 39; Demirtaş 2018: 67; Tekin 2018: 83; Yağcı 2019: 51, 53; Yiğitpaşa – Yağcı 2020: 533-534; Çakır 2021: 36; Keskin – Yıldız 2022: 124.

139. Müller-Karpe 1994: 199, tab. 19.2.

140. Koşay – Akok 1973: 27, tab. XLVI. A1.R.75; Müller-Karpe 1994: 199, 204, tab. 18.3, 19.4, 33.3; Akdeniz – Karaca 2004: 53.

141. Özkalalı-Ekmen 2012: 105; Yağcı – Kaya 2012: 173, fig. 7.

142. Dullo 1936: 88; Erkanal 1977: 3, 8, tab. 1.1-5; Müller-Karpe 1994: 144, 203-204, tab. 31.1-3, 33.2, 50.3; Akdeniz – Karaca 2004: 53; Bilgi 2004: 27, L/U 25; Berkcan 2006: 109.

143. Przeworski 1939: 22; Muscarella 1988: 412, no. 566; Müller-Karpe 1994: 144; Rabinovich 2016: 39; Keskin – Yıldız 2022: 124, 134.

main types.[144] Przeworski's Type I samples have sharp protruding lugs. His Type II has symmetrical lugs. Type III has blunt lugs. Type IV features small lugs that rise abruptly with right angles. With their shape, they form a kind of cross. Przeworski established his Type V in light of a rock relief near In-Bazzar and a mould found in the Gavur Castle.[145] He opines that the In-Bazzar relief lacks lugs because of a sculpturing mistake. Moreover, he states that it is impossible to define the Gavur Castle mould[146] properly as it was only partly preserved. Notwithstanding these unfavorable facts that he detects, Przeworski suggests that the knob-shaped formation on top of the male socket is particularly suitable to match certain European findings.[147] According to his typology, Types I and II have distinctive lugs and differ only in terms of lug arrangement. Therefore, it does not pose any problems to examine them under a single type. The lugs of his Type III are nearly lacking, and this is why they should be examined as a separate type. Type IV is visibly different from the other types with its general design that forms a cross shape. He himself remarks that the evidences he provides for his Type V, namely a partially-preserved mould from the Gavur Castle and the In-Bazzar rock relief, are insufficient. So, it is clear that the In-Bazzar relief lacks lugs for whatever reason, and the form of the Gavur Castle mould remains undetermined. Therefore, it is obvious that Przeworski's Type V will stay problematic as long as new evidence is not found. In view of the above data, it can be said that the axes examined by Przeworski can be analyzed more correctly under three different types instead of five.

Dullo takes account of the general changes seen in the forms of the axes and the main regions of their geographical distribution and thus classifies them into three main types with multiple variations. Accordingly, he examines the samples having a tongue-like shape within the "Asia Minor-Syrian Type", those with a cross-like shape within the "European Type", and those with a shouldered shape within the "Transcaucasian Type" categories. The Asia Minor-Syrian Type generally has a tongue-like form. Most of the time, the small pointed lugs distinctly separate the barrel from the male socket. The male socket is either round or trapezoidal. As for the barrel, it has curved sides stretching only towards the cutting edge. Dullo suggests that it would be more correct and efficient to separate this type (the Asia Minor-Syrian Type) into variants according to the general variations in the forms of the axes instead of Przeworski's typology, which is based on the variations of lugs. In this context, he first separates the Asia Minor-Syrian Type into two variants, namely the Thick-Butted Variant I and the Thin Variant II, according to the shape-related differences in the general design. After that, he adds the Asia Minor Variant III into the combination in view of several samples, such as those from Gezer and Addzul in the Syrian and Palestinian Regions and those from Haghia Triada of Crete in the Aegean Region. Asia Minor Variant III virtually lacks lugs. The part where the lugs are located is in the shape of an angular corner. This variant corresponds to Maxwell-Hyslop's Type II. Dullo states that the type Przeworski established according to the In-Bazzar rock relief and the mould from the Gavur Castle does not represent the lugged axe in any way. According to Dullo, the In-Bazzar rock relief represents a shaft-hole axe. And it is impossible to determine whether the Gavur Castle mould is lugged or not since it consists of several pieces. Dullo's European Type has a long, narrow, and flat

144. Przeworski 1935: 413; Przeworski 1936: 49-57; Przeworski 1939: 31.

145. Przeworski 1939: 31-32.

146. Müller-Karpe 1994: 205, tab. 34.5.

147. Przeworski 1936: 54-55; Przeworski 1939: 32.

body. Its quadrangular lugs are small, distinctive, and right-angled. This is how they form some kind of cross shape on the flat body of the axe. Some samples have blades expanding towards the cutting edge. This type has a limited number of insignificant variations. The Transcaucasian Type constitutes a peculiar type in itself despite certain differences. Its barrel has a wide, long, and curved edge. Its lugs are pointed and oftentimes bent upwards. The male socket is short and narrow. The length of the male sockets ranges from one-fourth to one-eight of the axe's total length.[148] Therefore, it seems quite plausible that Dullo suggests a typology by taking account of the shape differences in the general design of the axes instead of the typologies based on the detail differences. However, the virtual lack of lugs on the samples that he examines within the Asia Minor Variant III makes one think that they should be treated as a main type instead of a variant.

Maxwell-Hyslop finds these detailed typological suggestions meaningless. A limited number of axes found in stratified can appear as different types. Hence she remarks that the established typological classifications cannot play any role in the chronological progress of the axes. Maxwell-Hyslop considers the proportion of the lug protrusions and the general form of the axes in particular, and thus establishes three types. Her Type I has a splayed barrel. Its distinctively protruding lugs are placed closer to the male socket. Type II's barrel is longer than the Type I's, with more indistinct lugs. Type III has a long and narrow barrel with distinctive lugs.[149] As much as we acknowledge the accuracy of Maxwell-Hyslop's Type I and II classifications, her Type III still seems problematic. Maxwell-Hyslop includes in her Type III both the cross-shaped and the shouldered samples from Dullo's typology. Still, it can be stated that the cross-shaped and shouldered samples would be more properly examined as two separate types, Type III and Type IV, respectively.

Deshayes might be the scholar to put forth the most detailed analysis in terms of classification. He states that the researchers before him have considered various criteria in their typological suggestions and that they are valid in several aspects. However, he thinks that the previous suggestions are based on too limited criteria, which disregard all of the available data. And he adds that he takes a wide variety of data while establishing his typological suggestion. He grounds his suggestion on several fundamental criteria; dimensions of the barrel and the male socket and their proportional comparison, general form of the body, form of the lugs, and finally, the form of the barrel edges and sections. In light of these criteria, Deshayes establishes a very detailed classification encompassing seven main types, nineteen subgroups, and several samples that do not fall into any of these types or groups. His Type A is generally characterized by a long male socket and barrel, very distinctive lugs, and slightly concave barrel edges. This type is divided into two subgroups, the A.a and A.b. The fundamental criterion for the creation of these two subgroups is the difference between the male sockets. A.a has a rather long and narrow male socket while A.b has a short and wide male socket. As its general characteristics, Type B features a short barrel, virtually nonexistent lugs, and slightly concave barrel edges, and the part where the lugs are located forms an angular corner. Except for the form of the lugs, Type B is similar to the Type A.a samples. Type B is also divided into two subgroups, B1 and B2 because different forms of the male sockets required the findings to be examined within two subgroups. The male socket of B1 tapers beginning from the lugs towards the top while B2 virtually lacks such a taper. The general

148. Dullo 1936: 88, 90-95, 97.

149. Maxwell-Hyslop 1953: 72, figs. 4-6.

characteristics of Type C include a wide, distinctive male socket, very pointed and sharply-defined lugs, and a thick-butted barrel with significantly concave edges. It seems that this type was derived from the subgroup A.b. However, its lugs are more strongly noticeable. Type C is also separated into various groups, namely the C1.a, C1.b, C2.1, and C3. The differences of the male sockets and lugs were the main criteria for establishing these groups. The main characteristic to distinguish C1.a from C1.b is the difference between the male sockets. Sharply-defined in both groups, the male socket of C1.a is more rounded and relatively short while C1.b has a longer, angular, more distinctive male socket. The lugs of C2.1 are more protrusive than C1 samples. As for C3, it has rather visible lugs that bend towards the male socket. The Type D features a male socket that is oftentimes very narrow and short, asymmetrical lugs, a short and very wide barrel with an upwardly-expanding blade, and very concave edges exceeding 180^0. This type is also divided into several groups: the D1.a, D1.b and D2. The differences of the male sockets, lugs, and barrels were the fundamental reasons for establishing these groups. D1.a has a relatively long male socket and indistinct lugs while D1.b is bulkier with a short male socket and very sharply-defined lugs. D2 has similar lugs but its male socket and especially its barrel show notable differences. Its lugs are bent towards the male socket. However, some samples have rather short male sockets while others have long ones. And some samples feature slightly curved barrels with moderately concave edges, while others are semicircular, resembling the bottom part of a violin. The male socket of Type E can be shorter or longer. This type has small but distinctive lugs. Its barrel is narrow and long, with a blade that slightly expands towards the end. The edges of the barrel are slightly concave in general, but some samples with very concave edges also exist. This type is separated into three groups: E1, E2 and E3. The fundamental criteria for the creation of these groups are the differences of the male socket, lugs, and the barrel. E1 has small, pointed, sharply-defined lugs. Its male socket is long. Its narrow and flat barrel expands towards the end. E2's lugs are small and pointed. The male sockets and barrels may vary in this type. The male sockets can be shorter or longer. Some samples feature barrels with slender and flat ends while others have barrels that expand towards the blade. E3 has slightly protruding, semicircular lugs. The male sockets are generally shorter in this type. Some E3 samples have slender and flat barrels that slightly expand towards the cutting edge, while others have a more expanded form overall, becoming semicircular in shape. Type F can also have shorter or longer male sockets. This type has symmetrical lugs, which form an angular corner between the male socket and the barrel. Generally, the narrow and long barrel expands towards the cutting edge. Moreover, the barrel has concave edges, and there exist several samples with semicircular blades. This type is divided into three subgroups: F1, F2, and F3. F1 has a long male socket, lugs that form an angular corner between the male socket and the barrel, and a narrow barrel with a slightly expanded blade. The barrels and lugs of F2 are similar to F1. However, F2 generally features shorter male sockets which become narrow towards the top. F3 has well-defined lugs and short male sockets that expand in parallel with the lugs, forming protrusions towards the top. The semicurcilar cutting edge is wider than the previous groups. The general characteristics of Type G include a typically short male socket and, as distinct from the other types, two lugs on both sides, which means a total of four lugs. These lugs are sometimes similar to each other, while other times they can differ. The barrel is generally slender and long with an expanded blade. This type is separated into two subgroups: G1 and G2. All the lugs of G1 are alike, while the lugs of G2 can

vary in terms of form and size.[150] Deshayes not only deals with a vast geographical area, but also examines a large number of findings to bring forth the creation of this detailed typological classification. This detailed classification offers certain advantages while, at the same time, leading to several problems. For example, it can be stated that certain samples from his Types E and G are chisels rather than axes. Furthermore, it is hard to draw precise lines between the samples that are examined within different types and subgroups. For instance, Group A.b samples that are examined under Type A are similar to many samples from Group B and C. It is also observed that certain samples examined within certain groups can be quite different, as is the case with Group E2.

Erkanal takes Central Anatolian samples into consideration, and thus establishes a remarkable typology with intricate details. Nevertheless, as also indicated by Muscarella, the types of Erkanal's typology have a correlation problem.[151] Erkanal sets forth the differences that he detects in the general structural form, male sockets, and lugs of the axes, and suggests a typology comprising five types. His Type I features a biconvex or trapezoidal male socket. The lugs are generally well-defined. They slightly bend away from the barrel, whereas they protrude from the male socket orthogonally. The barrel is long with a flat or curved cutting edge. The male socket and barrel of Type II are similar to the Type I. However, this type has indistinct lugs that form rather angular corners. The male socket and barrel of Type III are also similar to the Type I. However, Type III features well-defined lugs that rise from the male socket with an acute angle and then bend towards it. Type IV's male socket is partly skewed but mostly quadrangular. The lugs are small, blunt, and well-defined. The male socket of Type V is almost concave, just like a knife. The lugs are usually not very well-defined. They rather form angular corners.[152] Considering this typology, the samples examined under Types I, III, and IV do not have any notable differences in their general forms. The most significant difference is the acute-angular lugs of Type III. Similarly, Type II shows parallelism to Type V in terms of general form. It is quite hard to detect any notable differences enough to alter the general forms of the Type II and Type V axes. In brief, it can be said that two main types come to the fore instead of five in view of the samples presented by Erkanal.

Bilgi discusses the nine-lugged axe from the Samsun Museum under a single type but divides that type into three subgroups. He arranges these groups as axes with male socket holes, axes without male socket holes, and axes with elongated barrels. Both the samples with male socket holes and those with elongated barrels are characterized with lugs having the form of an angular corner.[153] Comparing the notable differences amongst the axes (particularly the lugs) with the typological suggestions of the other researchers, it becomes clear that they should be treated as two separate types instead of one. In this context, it is possible to examine Subgroups 1 and 3 within Type II of Maxwell-Hyslop's typology, and Subgroup 2 having protruding lugs without male socket holes within his Type I.

Anlağan and Bilgi discuss the seven-lugged axe from Sadberk Hanim Museum under a single type. However, they categorize the axes into three subgroups because they have lugs with different forms. Accordingly, Type Ib.1 features long and blunt lugs, Type Ib.2 short and pointed lugs, and

150. Deshayes 1960: 114-126, tabs. XIII-XV, LV.

151. Muscarella 1988: 412, no. 566.

152. Erkanal 1977: 3, 5-7, tab. 2.23-25.

153. Bilgi 1994: 255-57, 266-267, tab. 57. fig. 5.

Type Ib.3 comprises a single sample with lugs slanted towards the nape.[154] It can be stated that all three subgroups resemble one another and can be examined within Type I of Maxwell-Hyslop's typology.

The lugged axe preserved in Bilecik Museum features a chunky form with a quadrangular male socket, slightly distinctive lugs bent towards the male socket, and a barrel with curved egdes and a semicircular blade (figs. 1-3). Considering these properties, it is possible to examine it within Przeworski's, Maxwell-Hyslop's and Erkanal's Type I, Dullo's Type I-Thick-butted Variant I, Deshayes' Type C-Group C1.b, Bilgi's Type I-Group 2, and Anlağan and Bilgi's Type Ib.3.

10. *Types of Handle Attachment*

Three different suggestions stand out when it comes to the question of how the axeheads were attached to the wooden/organic hafts. The first one is that the axehead was horizontally attached to a long angular haft by wrapping a rope/leather outside the haft.[155] The second suggestion is that the axehead was fitted into a socket that had been notched on the tip of a wooden haft parallelly, and then fastened with a rope/leather.[156] And the third one is that the axehead was not fixed onto any kind of haft, and that it might have been used as an anvil in metal workshops.

Some researchers put the first suggestion forward for all lugged axes,[157] while others suggest that only several samples that were used as adzes were as such.[158] There were three mainstays to play significant roles in the development of the first suggestion. The first one is the adze that is depicted in the woodworking scene of the mural on Tomb 100 in Thebes, Egypt.[159] However, the adze depicted in the scene lacks lugs. Therefore, it is not possible to present that mural scene as evidence. The second one is a lugged axe that was found in Acemhöyük.[160] The male socket of this sample is decorated. The idea that the decorated surfaces should be apparent was shown as evidence for the first suggestion. However, in contradistinction to the Acemhöyük sample, the decorative engravings are located between the lugs and/or the barrel of both the Bilecik Museum sample and other decorated samples.[161] Hence, it can be said that the evidence is insufficient for such a suggestion, which only refers to a single sample. The third one involves the sturdiness of the axes during use. Accordingly, if the axe was mounted in a slot carved into the haft, the haft would break due to the pressure during use, and the axe would become useless. Therefore, the axehead must have been fastened onto the long angular haft with a rope/leather from outside the haft in order to make the axe durable.[162] However, most of the people who use axes in their daily lives

154. Anlağan – Bilgi 1989: 41-42, figs. 23-29.

155. Bass 1967: fig. 111.

156. Bryce 2007: 33.

157. Petrie 1917: 17; Dullo 1936: 88; Erkanal 1977: 8; Muscarella 1988: 412, no. 566; Siegelová – Tsumoto 2011: figs. 4.b, 4.7; Keskin – Yıldız 2022: 124, 132.

158. Przeworski 1939: 31-32; Yağcı 2019: 53; Yiğitpaşa – Yağcı 2020: 533.

159. Siegelová – Tsumoto 2011: figs. 4.b, 4.7.

160. Akyurt 1998: 135, ill. 112c; Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 206, cat. no. 013.

161. Przeworski 1935: 413-414, tab. L.a; Dullo 1936: 90; Maxwell-Hyslop 1953: figs. 4.4-5, 10; Berkcan 2006: tab. 22.6-7; Yıldırım 2011: 117, fig. 4; Ateş 2019: cat. no. 103.

162. Muscarella 1988: 412, no. 566.

would agree that such an attachment does not make an axe more sturdy. Considering each of these three pieces of evidence presented for supporting the idea that the axehead was fastened onto the haft from the outside, it can be stated that they are insufficient for making such a claim.

There were three mainstays in the development of the second suggestion, which involves the axehead being fit into a socket notched on the tip of a wooden haft. The first one focuses on the idea that the metal part must have been fixed into the slot carved into the haft by a rope in order for the haft attachment not to weaken or break on heavy impact, and that the lugs thereby played a significant role. Accordingly, the lugs reinforced the impact resistance of the metal axe and supported its attachment with the rope.[163] It can be said that the existence of the lugs, and the metal being mounted in the slot carved into the haft and fastened with rope/leather would sufficiently add to the durability of the axe. The second suggestion follows the Fraktin-type axes. According to that, the Fraktin type's head has not only a socket but also lugs. Therefore, it can be stated that lugged axes have an appearance similar to the Fraktin type.[164] The third one takes account of the iconography of Egyptian wall art paintings,[165] especially the rock relief in In-Bazzar.[166] However, when one inspects the iconography, s/he can see that the depicted axes lack lugs.[167]

The mainstay of the third suggestion was that several findings have blunt cutting edges. The existence of blunt-edged samples gave birth to the idea that they had not been used as weapon or woodworking tools. Accordingly, the blunt-edged samples must have been used for bending the edges of equipment such as shields, buckets, or cauldrons, or served as anvils or workbenchs in metal workshops.[168] However, the production process indicates that the axes were blunt in the first place when unmoulded and that they were subsequently sharpened by hammering. Therefore, their blunt cutting edges indicate that the production process was unfinished and they were yet to come into use. Given the size of the axes, it can be noted that they are too small and not stable enough to serve as anvils. Considering the form of the axes, they clearly display a specific form with their curved edges and lugs. Whereas it would be enough for a metal piece to just be square in order to serve as an anvil. In that case, such extra effort would not be made for it to have such a specific form. Hundreds of samples quantitatively and clearly demonstrate that they were not used merely as anvils. The production process, dimensions, forms, and multitude of the axeheads point to that the suggestion is reasonably ungrounded.

Consequently, in view of the samples presented above, the second suggestion involving the axehead being mounted into a slot carved onto the tip of the haft and fastened with a rope/leather reinforced by the lugs seems to be the most plausible, although we do not have any data neither iconographically nor of an organic axe haft (fig. 6). Of course, certain types, especially those presented by Deshayes, should be excluded from this suggestion since they most probably served as adzes or chisels instead of lugged axes.[169]

163. Przeworski 1935: 410; Przeworski 1939: 32; Erkanal 1977: 8; Özkalalı-Ekmen 2012: 102; Tekin 2018: 83; Yağcı 2019: 53; Keskin – Yıldız 2022: 124, 131.

164. Erkanal 1977: 8.

165. Keskin – Yıldız 2022: 124, 132.

166. Przeworski 1935: 410, 412; Przeworski 1936: 54-55; Przeworski 1939: 32; Dullo 1936: 90, fig. 8.1; Maxwell-Hyslop 1953: 69; Müller-Karpe 1994: 169.

167. Dullo 1936: 90, fig. 8.1; Przeworski 1936: 54; Maxwell-Hyslop 1953: 69.

168. Maxwell-Hyslop 1953: 71; Macqueen 2001: 67; Şerbetçi 2008: 83; Keskin – Yıldız 2022: 124, 133.

169. Deshayes 1960: 114-126, tab. XIII-XV, LV.

11. *Function*

We need written or iconographic evidence in order to accurately identify how or for which purpose ancient societies used tools. In case there are not any available written or iconographic data, we try to reach a conclusion by evaluating the relevant tool within its context. And the most prevalent method adopted in the absence of a stratified context is to copy the ancient tools, conduct modern experiments, and thus endeavour to obtain results. However, even though modern experiments provide us with insight about the intended use of a tool, its designated primary function is never its only function even in our modern society; therefore, it is not possible to reach an exact conclusion on this subject.[170] Likewise, we cannot reach an exact conclusion on the function of Bilecik Museum axe because it was not found in a stratified context and it lacks relevant written or iconographic evidence. However, we can make some deductions by evaluating the size of the axe and its decorative engravings and the previous suggestions about the matter in the literature. It is observed that the function of the lugged axe still continues to be discussed, and consensus has yet to be built on the subject in the literature. Still, it is recognized that this axe type was used for four different purposes according to the data:[171] 1. As a weapon;[172] 2. As a woodworking/lumbering tool;[173] 3. As an anvil in metal workshops;[174] and 4. As a tool.[175] The fourth suggestion of the axe having been used as a tool means its utilization for various daily works that probably include its 2nd and 3rd functions. It can be seen that the weapon and the woodworking tool suggestions particularly come into prominence, while the other suggestions are either supported with insufficient evidence or completely lack evidence. Lugged axes were found in tombs[176] and other places that may have had various functions[177] and were obtained from stratified[178] or unstratified.[179] The lugged axes that were left in tombs indicate their significance as personal belongings involving the belief in the afterlife, but they provide no evidence on their functions. In view of the previous analyses of both the stratified and unstratified, it can be seen that they were separately examined without taking their environment into consideration, and therefore they fall short of deducing the main function of the axes. Considering the sites where the

170. Mathieu – Meyer 1997: 333.

171. Özkalalı-Ekmen 2012: 102.

172. Koşay – Akok 1966: 77; Erkanal 1977: 8; Süel 1989: 145, 147, 150, 155, ill. 5.B1.Bg/9; Mellaart – Murray 1995: 115; Macqueen 2001: 66, no. 31; Bilgi 2001a: 9; Sevin 2003: 150; Berkcan 2006: 123; Bryce 2007: 63; Seeher 2007: 29, fig. 3; Şerbetçi 2008: 83, fig. 13b; Yıldırım 2011: 118; Çetin 2015: 115; Erdem 2015: 133; Demirtaş 2018: 67; Akgül 2019: 85; Ateş 2019: 6; Yağcı 2019: 52; Yiğitpaşa – Yağcı 2020: 532; Erdoğdu 2021: 3, 140-145, 163, cat. nos. 53-56; Keskin – Yıldız 2022: 124, 127.

173. Przeworski 1939: 32; Boehmer 1972: 37; Macqueen 2001: 67; Şerbetçi 2008: 83; Yıldırım 2001: 127, 129; Erdem 2015: 175; Akgül 2019: 85; Yağcı 2019: 52; Yiğitpaşa – Yağcı 2020: 533.

174. Maxwell-Hyslop 1953: 71; Macqueen 2001: 67; Şerbetçi 2008: 83; Keskin – Yıldız 2022: 124, 133.

175. Erkanal 1977: 8; Bilgi 2001a: 9; Yıldırım 2011: 118; Çetin 2015: 115; Demirtaş 2018: 67; Akgül 2019: 85; Yağcı 2019: 52; Yiğitpaşa – Yağcı 2020: 532; Keskin – Yıldız 2022: 124.

176. Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 103; Yiğitpaşa – Yağcı 2020: 533.

177. Oyman 2003: 35; Süel – Süel 2004: 231, fig. 8; Seeher 2007: 29-31, fig. 3.

178. Özkalalı-Ekmen 2012: 105; Erdem 2015: 6, 34-35, 102, 133, 147, 149, 175, tab. 5, 7, 9, 13; Akgül 2019: 84-85, 87, fig. 49a.

179. Oğuz 1933: 53-54, 59, ill. 53-e-1590; Yıldırım 2001: 127, 130, figs 6-7, tab. 2a-b; Berkcan 2006: tab. 22.8.

Boğazköy[180] and Ortaköy-Şapinuva[181] findings were unearthed, it is observed that they were found in places that had served military purposes or alongside military equipment sets such as the combination of an armor and a helmet. With regards to the data, it can be remarked that one of the main functions of the lugged axe was serving as a weapon for military purposes.

It can be said that the Bilecik Museum sample would be inefficient for woodworking activities with its miniature size of 11.2 cm. Moreover, considering its various decorative engravings, it seems more plausible that such an ornate axe was probably used as a weapon rather than a woodworking tool.

12. *Dating*

There is no consensus amongst researchers about the emergence and out-of-circulation dates of the lugged axe. Acemhöyük,[182] Alişar,[183] Balıbağı,[184] Beycesultan,[185] İkiztepe,[186] Kültepe,[187] Seyitömer,[188] Sinop Museum,[189] Tell el Cudeyde, and Tureng Tepe[190] come to the fore when it comes to the earliest lugged axe samples and their moulds. The aforementioned samples are dated between the last quarter of the 3rd Millennium B.C. and the first quarter of the 2nd Millennium B.C. The majority of the axes unearthed in the said findspots are far from suggesting a narrow timeframe. However, putting all of the obtained data together, it can be stated that the earliest lugged axe samples appeared around 2100/2000 B.C.[191] It is either not possible to bring forward any precise data about when this axe type fell into disuse. However, considering the latest axes and axe moulds,[192] it can be suggested that they remained in use until the first quarter of the 1st Millennium and went out of circulation thereafter. In light of the unearthed moulds and axes, and as is acknowledged by many researchers, it can be stated that this axe type was widely used throughout the 2nd Millennium B.C. in the general sense.[193]

180. Seeher 2007: 29-31, fig. 3.

181. Süel – Süel 2004: 231, fig. 8.

182. Berkcan 2006: 171; Özkalalı-Ekmen 2012: 102-106, 198-199, 206, cat. nos. 013-014.

183. Przeworski 1935: 411.

184. Süel 1989: 145, 147, 150, 155, ill. 5.B1.Bg/9.

185. Erdem 2015: 6, 34-35, 102, 133, 147, 149, 175, tab. 5, 7, 9, 13; Keskin – Yıldız 2022: 129, 136.

186. Bilgi 2004: 75, L/U 15.5; Keskin – Yıldız 2022: 130.

187. Erkanal 1977: 8, 10; Akgül 2019: 84-85, 87, fig. 49a; Yıldırım 2011: 283, no. 273.

188. Bilgen 2011: 206, 318, 320, 374-375, 381-382, 444, 478-479, figs. 19, 309, 319; Bilgen 2013: 34, fig. 78.

189. Çakır 2021: cat. nos. 23-28, tab. 1.7; Yiğitpaşa – Çakır 2022: 234-235, cat. no. 7-9, fig. 7-9.

190. Keskin – Yıldız 2022: 128-129, 136.

191. Bilgi 2004: 75.

192. Przeworski 1935: 412; Dullo 1936: 91-90, 98; Erkanal 1977: 10; Oğuz 1933: 53-54; Snodgrass 2000: 232-233, 235, tab. 84.

193. Oğuz 1933: 53-54; Przeworski 1935: 411-412; Dullo 1936: 88, 90-98; Gordon 1950: 58; Maxwell-Hyslop 1953: 72; Stronach 1957: 115; Puglisi 1964: 43-44, 46, fig. 3; Boehmer 1972: 37; Esin 1973: fig. 24; Erkanal 1977: 8-11; Muscarella 1988: 412, no. 566; Süel 1989: 145, 147, 150, 155, ill. 5.B1.Bg/9; Süel – Süel 2004: 231, fig. 8; Ökse – Toy 1992: 138; Bilgi 1994: 255-257, 266-267, tab. 57. fig. 5; Bilgi 2001a: 68, fig. 95 a1; Bilgi 2004: 75, 77, 78, 80, 87, 90, 95, L/U 11.4, L/U 15.5; Anlağan – Bilgi 1989: 41-42; Snodgrass 2000: 232-233, 235, tab. 84; Yıldırım 2001: 135; Yıldırım 2011: 283, no. 273; Özdoğan 2002: 74, fig. 5; Oyman 2003: 35; Hansen 2005: 93; Berkcan 2006: 171; Seeher 2007: 29-31, fig. 3; Stoyanov 2010: 406; Özkalalı-Ekmen 2012: 102-106, 198-199, 206, cat. nos. 013-014; Çetin 2015:

Both the formal characteristics of the lugged axe preserved in Bilecik Museum and the samples with parallel decorative engravings were taken into consideration in our endavour of dating. Nevertheless, the existence of similar samples in terms of formal characteristics does not mean that their similarities match one another perfectly. Indeed, it can be seen that the samples examined within a single type by the researchers do not perfectly match one another in general either.[194] The key factor to play a role in this diversity is most probably the use of different moulds. The samples most similar to the lugged axe of Bilecik Museum in terms of form are known from Kültepe,[195] the National History Museum in Stockholm,[196] and Byblos.[197] The samples of Kültepe and the National History Museum in Stockholm are dated to the first half of the 2nd Millennium, whereas the Byblos sample dates back to the 14th-13th Centuries B.C. The most similar samples in terms of the decorative engravings can be found in Acemhöyük,[198] Bolu,[199] Byblos,[200] Göynücek,[201] Karahöyük,[202] Kayseri,[203] Kültepe,[204] and the National History Museum in Stockholm.[205] It is observed that the samples of Kültepe and the National History Museum in Stockholm are dated to the first half of the 2nd Millennium B.C., the Bolu sample to the 2nd Millennium B.C., the Byblos sample to the 14th-13th Centuries B.C., and the Göynücek sample to the Late Bronze Age. Considering both the form and the decorative features of the Bilecik Museum sample, it seems possible to date it to the first half of the 2nd Millennium B.C.

13. *Conclusion*

We were not able to obtain any data about the original name of the lugged axe during its widespread use in the 2nd Millennium B.C. And while going by many other different names, this axe type is mostly referred to as the “Lugged Axe” in modern literature.

It is observed that bronze was the preferred material for the production of the axe preserved in the Bilecik Museum. Indeed, bronze was the most widely-used material for making many other

115, 121; Erdem 2015: 6, 34-35, 102, 133, 147, 149, 175, tab. 5, 7, 9, 13; Rabinovich 2016: 39-40; Akgül 2019: 84-85, 87, fig. 49a; Ateş 2019: cat. no. 99-118; Yağcı 2019: 57; Yiğitpaşa – Yağcı 2020: 531, 537; Çakır 2021: tab. 1.7; Erdoğdu 2021: 3, 140-145, 163, cat. nos. 53-56; Keskin – Yıldız 2022: 128-130, 134, 136-137.

194. Erkanal 1977: tab. I-IV.

195. Yıldırım 2011: 283, no. 273.

196. Przeworski 1935: 413-414, tab. L.a; Erkanal 1977: 3-4, tab. 1.10; Berkcan 2006: 109, tab. 22.7.

197. Ateş 2019: cat. no. 103.

198. Erkanal 1977: 3-4, tab. 1.8; Akyurt 1998: 135, ill. 112c; Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 103, 206, cat. no. 013; Demirtaş 2018: 67.

199. Przeworski 1935: 413-414; Maxwell-Hyslop 1953: fig. 4.4; Erkanal 1977: 7, tab. 4.49.

200. Ateş 2019: cat. no. 103.

201. Bilgi 2001b: 23-24, ill. 78-79, fig. 47.

202. Maxwell-Hyslop 1953: fig. 4.10; Erkanal 1977: 4.

203. Przeworski 1935: 413-414; Maxwell-Hyslop 1953: fig. 4.5; Erkanal 1977: 3-4, tab. 1.6; Akdeniz – Karaca 2004: 53; Berkcan 2006: 109, tab. 22.6.

203. Przeworski 1935: 414.

204. Przeworski 1935: 413-414; Erkanal 1977: 6, tab. 3.32; Yıldırım 2011: 117, fig. 4.

205. Przeworski 1935: 413-414, tab. L.a; Erkanal 1977: 3-4, tab. 1.10; Berkcan 2006: 109, tab. 22.7.

tools during the 2nd Millennium B.C. This can be explained by the high availability of the alloy metal (copper+tin) and the technological levels of the said period.

The attachment style of the axe onto the haft continues to be one of the highly-disputed matters concerning the lugged axe. In this context, two opinions particularly stand out: The first one is that the axe was attached to a long angular wooden haft horizontally and fastened with a rope/leather from the outside. The second one involves the axe having been parallelly mounted into a slot carved into the tip of the wooden haft, and fixed with a rope/leather afterwards. As stated above, it can be said that the first suggestion is built on insufficient bases. And the second standpoint is based on 1) the formal similarity of the lugged axe with the Fraktin type; 2) some Egyptian wall art paintings and the iconographic data from In-Bazzar; and 3) the idea that the axe must have been fixed into a socket in the haft in order for the attachment not to break on heavy impact. Considering all of the aforementioned suggestions, it can be remarked that the second suggestion involving the axehead having been mounted into a slot carved into the tip of the haft and subsequently fastened with a rope/leather reinforced by the lugs seems plausible despite the lack of iconographical data or any data on an organic axe haft.

The motifs engraved on the lugged axe samples mostly comprise floral and/or geometrical patterns. It is not possible to exactly determine why the motifs were engraved. However, one must bear in mind that the decorations may vary according to needs and may have symbolic meanings in religious or military contexts. As is known, the shaft-hole axe emerged earlier than the lugged axe with its more well-developed structure in terms of sturdiness. Therefore, it cannot be stated that the lugged axe progressively emerged as a result of technological advancements considering the development levels of axes in general. However, it can be said that the lugged axe is definitely more advanced than the flat axe, constituting a completely different type. Moreover, the continued usage of the flat axe long after the emergence of the lugged axe and the detection of both type's negatives on the very same moulds indicate that they did not replace one another. Hence, it can be stated, in view of the data, that the lugged axe emerged independently and out of necessity following technological advancements and did not play any role in the development of any other axe types.

The form-based classification of findings is a method employed since the beginning of the 19th century. This method can be useful for establishing the chronological frameworks of artifacts, especially when no written documents are available. Typological classification is also an important method for evaluating various objects made of metal.[206] Considering that most of the lugged axes were found in unstratified and those obtained from stratified are typologically different, it can be stated that the previous typological classifications of the lugged type do not amount to much when it comes to the chronological development of axes, at least for the time being. It seems crucial to attempt a typology, at least for the samples that differ significantly, considering the idea that the data may change in consequence of future excavations and bear significant results concerning the geographical distribution and origin of the material. In view of the suggestions of leading researchers like Przeworski, Dullo, Maxwell-Hyslop, Deshayes, Erkanal, Bilgi, and Anlağan and Bilgi, the detailed typological assessments available do not play any role in neither their geographical distribution nor their chronological advancement. As Maxwell-Hyslop remarks, differences such as the various forms of the male socket, the size, angles, and place of the lugs, or

206. Tekin 2018: 13-14.

the numerous barrel forms are overly detailed and therefore seem insignificant. In this context, it can be stated that it would be more convenient to establish a simpler classification based on the notable differences in the general form of the axes, as Maxwell-Hyslop also suggests. In view of its general formal characteristics, it is possible to examine the Bilecik Museum axe within Przeworski's, Maxwell-Hyslop's and Erkanal's Type I, Dullo's Type I-Thick-butted Variant I, Deshayes' Type C-Group C1.b, Bilgi's Type I-Group 2, and Anlağan and Bilgi's Type Ib.3. As stated above, it is not possible to determine a single and primary function of a tool or to reach a certain conclusion on this matter. Nevertheless, the Bilecik Museum sample evokes the idea that it was probably used as a weapon with its miniature size of 11.2 cm and its decorative engravings.

Lugged axes are mostly found in the Central Anatolian region in Türkiye, and can also be encountered in a vast geography encompassing Armenia, Austria, Azerbaijan, Bosnia, Bulgaria, China, Cyprus, the Czech Republic, Egypt, Georgia, Germany, Greece, Hungary, India, Iran, Ireland, Italy, Lebanon, Pakistan, Palestine, Poland, Romania, Russia, Spain, Syria and Ukraine.

Considering the typological properties of the Bilecik Museum axe, it can be said to show parallelism with the negatives of the moulds found in Alacahöyük-Çorum,[207] Hacıbektaş-Suluca, Karahöyük-Nevşehir, Soli Pompeipolis-Mersin, and particularly, Kültepe-Kayseri. In light of its formal characteristics, it is possible to suggest that the relevant axe was made in a Central Anatolian site.

In view of the literary research, it can be remarked that the Bilecik Museum axe was cast into an open, single-piece stone mould and put through hammering, smoothing, and polishing processes, and then engraved decoratively by use of a pointed tool.

The lugged axe remained in use throughout an extensive geography between the last quarter of the 3rd Millennium B.C. and the first quarter of the 1st Millennium B.C., particularly during the 2nd Millennium. Utilized for more than a millennium, this axe type has come to be identified with the Hitites,[208] especially in Central Anatolia. Considering both the formal and the decorative properties of the axe in question, it can be seen that it shows parallelism with several samples from Acemhöyük,[209] Bolu,[210] Byblos,[211] Göynücek,[212] Karahöyük,[213] Kayseri,[214] Kültepe,[215] and the National History Museum in Stockholm.[216] In light of the dates suggested for these samples, it can be remarked that the Bilecik Museum axe dates back to the first half of the 2nd Millennium B.C.

207. Koşay – Akok 1973: 27, tab. XLVI. A1.R.75; Müller-Karpe 1994: 199, 204, tab. 18.3, 19.4, 33.3; Akdeniz – Karaca 2004: 53.

208. Macqueen 2001: 66, no. 31; Bryce 2007: 63; Şerbetçi 2008: 83, fig. 13b.

209. Erkanal 1977: 3-4, tab. 1.8; Akyurt 1998: 135, ill. 112c; Berkcan 2006: 16-17, 62, 80, 109, 123, 171, tab. 22.1; Özkalalı-Ekmen 2012: 103, 206, cat. no. 013; Demirtaş 2018: 67.

210. Przeworski 1935: 413-414; Maxwell-Hyslop 1953: fig. 4.4; Erkanal 1977: 7, tab. 4.49.

211. Ateş 2019: cat. no. 103.

212. Bilgi 2001b: 23-24, ills. 78-79, fig. 47.

213. Maxwell-Hyslop 1953: fig. 4.10; Erkanal 1977: 4.

214. Przeworski 1935: 413-414; Maxwell-Hyslop 1953: fig. 4.5; Erkanal 1977: 3-4, tab. 1.6; Akdeniz – Karaca 2004: 53; Berkcan 2006: 109, tab. 22.6.

214. Przeworski 1935: 414.

215. Przeworski 1935: 413-414; Erkanal 1977: 6, tab. 3.32; Yıldırım 2011: 117, 283, fig. 4, no. 273.

216. Przeworski 1935: 413-414, tab. L.a; Erkanal 1977: 3-4, tab. 1.10; Berkcan 2006: 109, tab. 22.7.

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Fig. 1. Lugged Axe in the Bilecik Museum

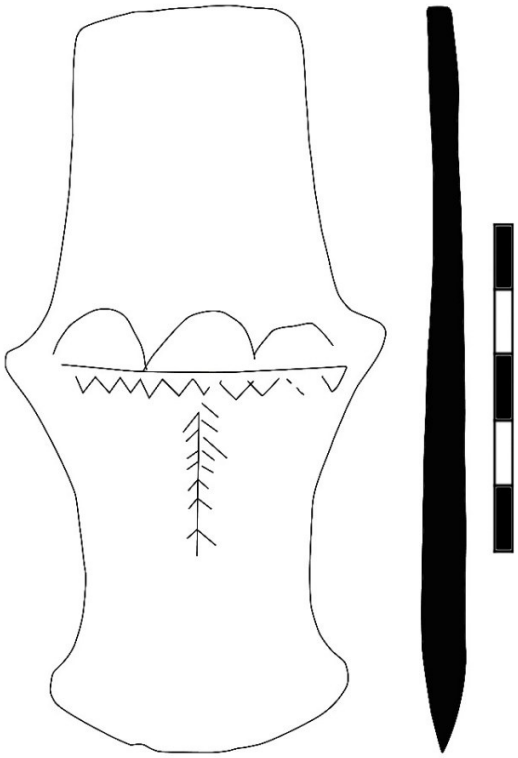

Fig. 2. Lugged Axe in the Bilecik Museum

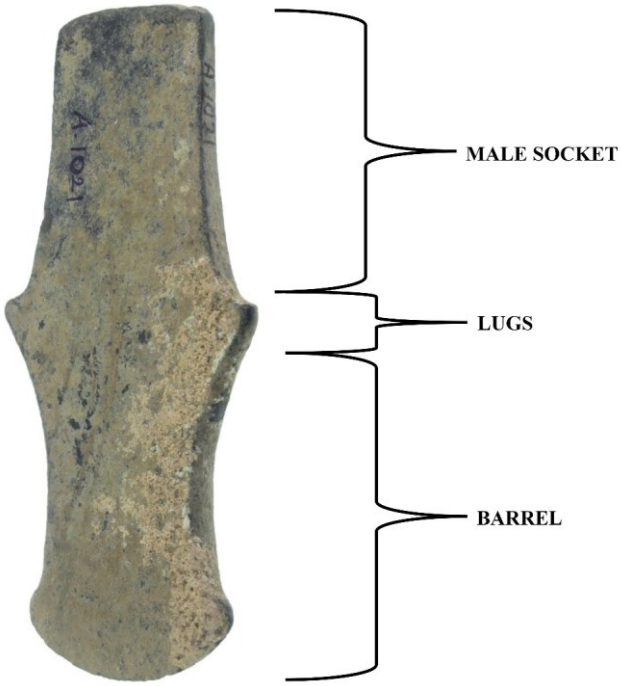

Fig. 3. Parts of Lugged Axe

Fig. 4. Distribution of Lugged Axe

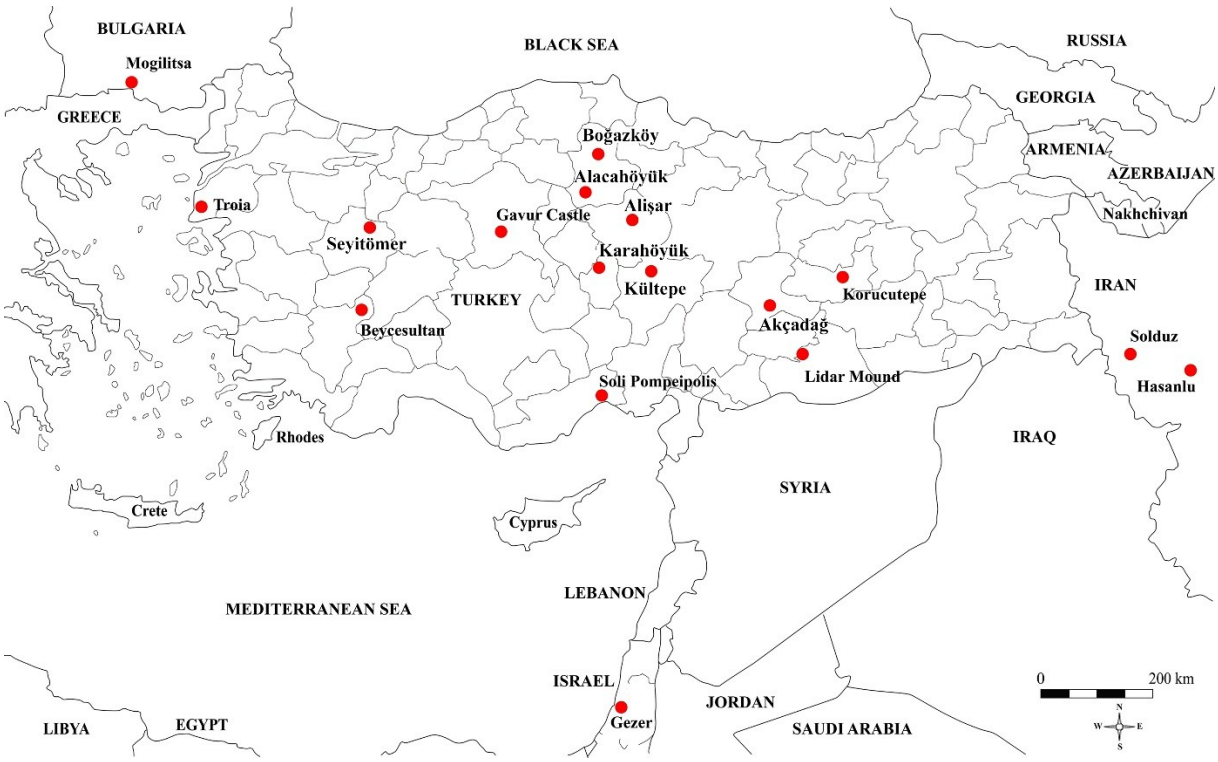

Fig. 5. Distribution of Lugged Axe Moulds

Fig. 6. Lugged Axe Usage Suggestion