

## LATE CHALCOLITHIC HARPOON HEADS FROM BULGARIA<sup>1</sup>

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### ВЪРХОВЕ НА ХАРПУНИ ОТ КЪСНИЯ ХАЛКОЛИТ, ОТКРИТИ В БЪЛГАРИЯ

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**Резюме:** Харпуните са многосъставни оръжия, от които при археологическите проучвания на праисторически обекти се откриват единствено назъбените им върхове. Поради това в научната литература все още не е напълно прието, че тези върхове са свързани с риболовния уред харпун. Въпреки че тези съмнения се отнасят основно за къснопалеолитните назъбени върхове в Западна Европа, подобна е ситуацията и при по-съвременните изследвания на халколитните върхове по Долния Дунав.

От територията на България са известни над 100 върха за харпуни, които се датират от самото начало на новокаменната епоха до края на каменно-медната епоха. Предмет на статията са 95 къснохалколитни върха за харпуни, открити в 7 археологически обекта. Основната цел е да се провери дали съществуват дадени регионални различия в характеристиките на харпуните, както и да се представят нови аргументи за тяхната функционална принадлежност.

Направата на назъбени върхове започва върху правоъгълна заготовка от еленов рог. Чрез директни и/или индиректни удари се постига общата форма на върха. Следващата операция е финалното оформяне на зъбците, а това е ставало с прилагането на поне две различни техники: чрез последователни удари с длето или чрез двустранни връзвания с кремъчен инструмент.

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Според разположението на зъбците харпуните са разделени на три типа: А. едностранни; В. двустранни асиметрични; С. двустранни симетрични. Всеки тип се дели на най-много три подтипа, които са дефинирани според процентния дял на обхвата на зъбците от общата ширина на върха: Подтип 1: върхове с прибрани към стъблото зъбци (под 33%); Подтип 2: върхове с равномерно разперени зъбци (между 33 – 50%); Подтип 3: върхове с разперени зъбци (над 50%). Най-често срещани са върховете от тип „В“ – 58% от типологически определените находки. Едностранните върхове заемат само 2,9%, което най-вероятно се дължи на тяхната недостатъчна ефективност.

На базата на редица различия сред изследваната колекция се обособяват две групи. Първата е обозначена като Северна (Русенска) група. Тя се характеризира с по-масивни и здрави върхове, снабдени с малко на брой зъбци, които са по-отдалечени (по-разперени) от стъблото. Типични представители на тази група са харпуните от Русе и Дуранкулак, но можем да прибавим и находката от Султан (дн. кв. „Невски“, Попово). Втората група е наречена Южна. Върховете са значително по-тънки и снабдени с по-голям брой зъбци, разположени близо до стъблото. Обектите от тази група са: Хотница, Великотърновско, Биково, Сливенско, и Голямо Делчево, Варненско. На този етап от проучванията най-вероятната причина за разликата между двете групи е разлика в размерите на ловуваната плячка.

Основната употреба на къснохалколитните назъбени върхове е била в риболова, като в това число включваме и лова на морски бозайници. Нов и определящ аргумент в подкрепа на това твърдение е тяхното ограничено географско разпространение – в обекти, пряко свързани с риболовната дейност. От друга страна, върховете за харпуни са далеч по-рядко срещани от кремъчните и костни върхове за стрели и копия, които се използват в лова на едрите сухоземни бозайници – т.е. харпуните имат по-специфична функция, свързана с точно определен вид плячка.

**Keywords:** harpoon heads, prehistoric fishing, Late Chalcolithic, Bulgaria

**Ключови думи:** върхове за харпуни, праисторически риболов, късен халколит, България

### Introduction

Harpoons are composite weapons consisting of a tip, wooden shaft and (usually) a line. During the excavation of prehistoric sites, only the tips are found as they are made from durable materials such as bone or antler. The barbs, which are shaped on one or both sides of the tip's trunk, are their characteristic feature. The distal end is pointed and the proximal part is shaped to allow insertion into or fixation onto a shaft and may have various components, intended for the attachment of a line (notch, protuberance, perforation) (**Bellier et al. 1995**, 5). The earliest specimens are found in Africa and date to around 90 000 years BP (**Yellen 1998**, 174). In Europe the major development of barbed points begins during the Upper Paleolithic, and a number of detailed studies are devoted to them (cf. **Pétillon 2009** and the references; **Langley 2014**; **Estévez, Vila 2013**).

The published harpoons from the Balkans are mostly from the time of Neolithic and Chalcolithic periods (**Васић 1936**; **Георгиев, Ангелов 1952**; **Comşa 1986**; **Mărgărit, Popovici, Vlad 2010**; **Mărgărit, Popovici 2011**). Despite the increased interest in these finds there are still several questions associated with them that remain without a definite answer – especially the ones regarding their function.

Until now more than 100 Neolithic and Chalcolithic harpoon heads are known from Bulgaria. The earliest of these have been found in cultural layers, which are dated to the very beginning of the Early Neolithic – first phase of Dzhulyunitsa-Smardesh, Veliko Tarnovo Region (**Еленски 2011**, 35), and Mayor Uzunovo, Vidin Region (**Ганецовски 2015**, 9, обр. 12: 2). However, above 90% of the barbed points are found in the Late Chalcolithic sites. Nevertheless, there has been no generalized and specialized research for this type of tips in the Bulgarian archaeological literature. Only Rafail Popov deals with “Harpoons as a weapon of the prehistoric man” but his article is dedicated almost exclusively to Paleolithic and Mesolithic harpoons from Western Europe (**Попов 1926**). So, the focus of the present paper is on the Late Chalcolithic harpoons that have been found in Bulgaria. The main tasks of this research is to verify the existence of regional similarities or differences of the harpoons, as well as an attempt of their functional interpretation – whether they were used for hunting, fishing, fighting or other purposes.

### Data and methods

This study is based on 95 whole and fragmented examples of harpoon points, of which 52 pieces are published<sup>2</sup> and 43 pieces – unpublished. We only have short and incomplete descriptions of two of the harpoons from Hotnitsa tell, Veliko Tarnovo Region (**Чохаджиев, Чохаджиев 2013**, 75; **Чохаджиев и кол. 2014**, 85), and they are not included in the technological and typological analyses, but they are included in the conclusions for geographical distribution. The finds herein originate from 7 sites on the territory of Bulgaria (*Fig. 1*).

For the purposes of the study all unpublished and re-examined artefacts are observed under a magnifying glass at low magnifications (x6 and x10). Conclusions about the traces of the manufacturing process on the tips are correlated with the results of the published studies (**Mărgărit, Popovici, Vlad 2010**, 37 – 40; **Mărgărit, Popovici 2011**, 36 – 38; **Mărgărit, Ștefan, Dumitrașcu 2013**, 152 – 153; **Beldiman, Sztancs, Ilie 2013**).

According to the morphological features, the harpoon heads are separated into two hierarchical levels – type and subtype. Three types are defined according to the position of the barbs – A. Unilateral; B. Bilateral asymmetrical; C. Bilateral symmetrical. The differentiation of the subtypes (denoted by figures – A. 1., A. 2., C. 1., C. 2. etc.) is based on the portion of barbs in relation to the width of the barbed zone (cf. **Weniger 1992**, 261). Each subtype has a certain value: Subtype 1: below 33%; Subtype 2: 33 – 50%; Subtype 3: over 50%. The percentage value of this portion (X%) is calculated by multiplying the result from the ratio between two values by 100 – the sum of the distances between the tips of two opposite barbs to the trunk to the maximum width ( $X=(A+B)/C \times 100$ ). The fragmented finds are included in the typology only when the preserved part is different from the first (distal) row of barbs (*Fig. 6: A*). This is necessary because that row is narrower and the proportion of the values in this area differs from the ratio in the middle part. According to this principle, each type consists of a maximum of three subtypes.

<sup>2</sup> Some of them are re-examined by the author. They are marked with “re-examined” in the catalogue (*Table 1*).

For more detailed analysis of the characteristics of the harpoon heads two additional classifications are made: according the shape of the barbs and according the shape of the proximal part (*Fig. 6: B and C*). The information from all features, expressed in metric or non-metric values, has been collected in a common database allowing their statistical processing, and can be completed in the future.

### Technology

The harpoons considered in this paper are made from antler. The main difficulty in studying the *chaîne opératoire* is the small number of blanks, or unfinished items. The only direct observations were made on two unfinished harpoons from Rousse<sup>3</sup> (Cat. №№ H 33 and H 60). On these items, the natural surface of the antler was first removed. Then the rough shaping was done by two-way cut using direct or indirect strokes (*Fig. 2*). First strokes are applied sideways to the reclining front part of the barb and then the unnecessary part is separated by a punch at the base of the next barb. The protuberances in the proximal part, which are used for the attaching a line, were formed by the same technique. The traces of the strokes are visible in all the barbs and the proximal part, i.e. after shaping the barb, the surface of the harpoon has not been further processed. The barbs have a rounded shape as they are adjoined to the trunk. The last operations that need to be made are the precise shaping of the barbs and the possible final polishing of the surface. Such unfinished harpoons are found in Măgura Cuneștilor, South Romania, and the researchers suggest that it is a stock of semi-manufactured supports to replace damaged pieces (Mărgărit, Ștefan, Dumitrașcu 2013, 152 – 153). Another unfinished point (Cat. № H 67) is presented with an illustration (Георгиев, Ангелов 1957, 67, обр. 28: 4). In this case it appears that the shaping of the point was started on an elongated blank taken from the compact tissue of the antler. Then the outer contours of two of the barbs were cut out, but it is not clear whether they are closer to the distal or to the proximal part because the upper part of the tip is missing. It should

<sup>3</sup> *Editorial note:* The spelling of Rousse in regards to the tell, the city and the museum is based on the already established French spelling in the Bulgarian archaeological literature in English instead of the rules established by the Bulgarian transliteration requirements, by which it should be Ruse.

be noted that the lower part of the barbs was cut perpendicular to the trunk. These unfinished points provide us with information about two techniques that differ in the angle by which the lower parts of the barbs were cut.

According to the traces on the harpoons from Bulgaria, two methods of final shaping of the barbs can be distinguished. The first technique is characterized by the removal of the excess part between the barb and the trunk of the harpoon by successive cuts with a chisel, which is evident from the unremoved traces of the individual strokes at the base of the barb (*Fig. 3: A*). The second technique is characterized by the shaping of the barbs only by incisions with a flint tool (*Fig. 4*). This technique is mostly used at the tips with closed barbs whose specific representatives are specimens from Bikovo, Sliven Region (Cat. №№ H 13 and H 14), and Golyamo Delchevo, Varna Region (Cat. № H 15).

The distal parts of all finds are smoothed and, in some cases – polished. This is the result of their further thinning with the aim to point and sharpen the tip. Usually fine and shallow striations of this activity are observable – a testimony that a fine abrasive was used. An exception is the harpoon from Durankulak (Cat. № H 6), the distal part of which was shaped by a flint tool. This is evident on the broad and deep striations on the surface of the object (*Fig. 5*).

According to the type of the proximal part various techniques were used for its manufacture. In specimens with protuberances, the latter are made the same way as the barbs – especially when a chisel is used (*Fig. 3: B*). The grooves and the perforations were carved with a flint instrument. The perforations were drilled from both sides.

So far it is impossible to distinguish long-distance differences in the technology of production of these weapons. The selected technique and the tools used are mainly dependent on the desired shape of the finished product and especially the barbs.

### **Morphology**

The data for some of the points are not complete because they are fragmented or are published without scale and dimensions. These circumstances further shrink the size of the examined sample, and re-

duce the reliability of the results obtained in relation to the metric values. Therefore, presented here are only results and conclusions which do not depend on the size of the collection for their scientific merit.

The fragmentary character of the studied collection is underlined by the fact that only 18 objects (19.4%) are fully preserved. However, in 69 cases (74.2%) it is possible to distinguish the type. The brief descriptions of the types and subtypes are presented below. The average values of the main dimensions are shown in *Table 2*.

Type A. Unilateral harpoons – 2 specimens.

The barbed area is only on the one side of the trunk. The two finds are from Bikovo (Cat. № H 13) and Rousse (Cat. № H 41). The proximal part of the first is missing; the harpoon has a flat section (with a thickness of only 0.5 cm), the 11 barbs are straight and sharp and are positioned close to the trunk – subtype A. 1. (*Fig. 7: Cat. № H 13*). The other point is 16.6 cm long, but a slight breakage at the very top is visible, probably as a consequence of the use, and the only barb is not preserved (*Fig. 8: Cat. № H 41*).

Although these two harpoon heads are united under one type, there is a large stylistic difference between them. This may reflect local cultural differences between the settlements or the difference in the function of the both harpoons.

Type B. Bilateral asymmetric harpoons – 40 specimens.

The barbs are located zigzag-wise on both sides of the trunk of the harpoon head (*Fig. 9*). This type is the most common one during the Late Chalcolithic in the territory of Bulgaria. A part of the collection (10 pieces) is not sufficiently preserved to allow the determination of their subtype. Among the other 30 harpoons, representatives of the three subtypes are found:

Subtype B. 1. In our collection there is only one bilateral asymmetric tip with closed barbs – Cat. № H 15 from Golyamo Delchevo (*Fig. 4*). The tip has a chipped distal end but now this part is restored and it is not possible to analyze the nature of the fracture. There are 7 straight and sharp barbs which are closed to the trunk. A specific feature of this barbed point is the long proximal part which has an L-shaped end.

A fragmented find from Rousse tell looks like asymmetric harpoon with closed barbs but the mesial part is missing and we can not be sure about it (*Fig. 9: Cat. № H 40*).



Subtype B. 2. The bilateral asymmetric tips with equable open barbs are 11 in number (Cat. №№ H 1; H 57; H 62; H 74; H 65; H 86; H 85; H 83; H 66; H 63; H 73). With the exception of Cat. № H 1, found in Nevski (Sultan), now-days part of Popovo, Targovishte Region, all the rest were found in Rousse tell (*Fig. 9: Cat. №№ H 57 and H 63*). Usually they are provided with 5 barbs that are straight and sharp or curved (only Cat. № H 83). There is some variability among the specimens of the subtype with regards to the shaping of the binding system. The proximal part is preserved on six of the objects and triangular shaped protuberances are seen on three of them; on the rest of the objects there is – perforation, groove or no additional shaping. Therefore, the tips of this subtype cannot be associated with a specific method of attaching to the shaft.

Subtype B. 3. The bilateral asymmetric harpoons with open barbs are the most numerous subtype – 18 objects (Cat. №№ H 2; H 6; H 68; H 58; H 35; H 43; H 29; H 61; H 46; H 53; H 84; H 45; H 31; H 52; H 95; H 32; H 81; H 82). All of them originate from Northern Bulgaria – Rousse (16 specimens; *Fig. 9: Cat. № H 58*), Hotnitsa (1 specimen, Cat. № H 2) and Durankulak – Golemia oštrov (1 specimen, Cat. № H 6). As with the previous subtype, most of the harpoon heads have straight and sharp barbs, and only in one case they are curved (Cat. № H 6; *Fig. 5*). With regards to the attachment method, a smaller variety of methods is observed: by triangular protuberances (7 objects) or rectangular protuberance (1 object), without additional shaping (2 objects). Among the findings of this subtype we must distinguish the harpoon head from Durankulak, which stands out with a specific shaping of the barbs, and the proximal part that is very thinned at its end.

As a distinctive feature of the bilateral asymmetric tips, we may point out that they have predominantly sharp and straight barbs that are distant from the trunk.

Type C. Bilateral symmetrical harpoons – 27 specimens.

The barbs are arranged symmetrically on both sides of the trunk and thus rows are formed. In 37% of the cases (10 specimens) the barbs are broken or the harpoons are not finished and it is not possible to determine the subtype. Compared to the previous type, the



distribution of the subtypes is more balanced and somewhat inversely proportional:

Subtype C. 1. Bilateral symmetrical harpoons with closed barbs were found in the settlement mounds near Hotnitsa (Cat. № H 3), Bikovo (Cat. №№ H 11 and H 14) and Rousse (Cat. №№ H 26 and H 64). The barbs are straight and sharp. On one of the harpoons from Bikovo two perforations drilled in the proximal end of the trunk between the barbs were used for the rope attachment (*Fig. 7: Cat. № H 14*). Probably this point has been repaired after breaking its initial proximal part. The remaining points with preserved proximal parts have triangular (Cat. № H 3) or oval (Cat. № H 64) protuberances.

The harpoons from Hotnitsa and Bikovo are smaller than those found in Rousse. The specific shape of the barbs of one of the points from Bikovo does not have a parallel outside the site's assemblage (*Fig. 7: Cat. № H 14*); the same applies to the elongated proximal part of the object from Hotnitsa.

Subtype C. 2. The bilateral symmetrical points with equable open barbs number eight in total: Cat. № H 12 (Bikovo); Cat. №№ H 7 and № H 10 (Durankulak); Cat. №№ H 28, H 72, H 87, H 89 and H 91 (Rousse). These points have relatively larger sizes than the previous subtype, but their distal part is shorter. The barbs are shaped in the same way – straight and sharp. The only exception is the specimen from Durankulak (Cat. H 7) whose curved barbs are poorly shaped and partially fragmented. The proximal part of the harpoons is equipped with triangular (4 objects) or oval (1 object) protuberances.

In this subtype again, a certain difference in the size of the harpoon heads from the different settlements is noted. This is most clearly seen when comparing the distal parts – those of the harpoons from Rousse are more elongated compared to the other two sites – Bikovo and Durankulak.

Subtype C. 3. The bilateral symmetrical points with open barbs are registered only among the collection of Rousse tell – Cat. №№ H 34, H 56, H 59 (*Fig. 8: Cat. №№ H 34, H 56, H 59*) and H 90. The barbs are straight and sharp. The proximal parts are without addi-

tional shaping (Cat. №№ H 56 and H 59) or with triangular protuberances (Cat. №№ H 34 and H 90).

The distance between the barbs of the bilateral symmetric points is smaller. The barbs are more numerous and closer to the trunk. The shaping of the proximal part is diversified.

The scarce number of unilateral barbed points is noticeable – only 2.9% of the typologically identifiable finds. This “unpopularity” of harpoon heads of type A is probably due to the low success rate of the hunting/fishing with them. The most of the harpoons have bilateral asymmetric points (58%) while those with bilateral symmetrical tips are less common (39.1%). Because of this very uneven distribution it is possible to make real comparisons only between the features of harpoons of type B and type C.

When comparing the fully preserved specimens, the bilateral symmetrical harpoons stand out with their larger size and as a consequence of this – with more elongated distal parts. The main differences between types B and type C are associated with the barbs and their features. It was already noted that the bilateral symmetrical harpoon heads have relatively more closed towards the trunk barbs. The average distance between the barbs is 2.9 cm, while for harpoons of type B – 4.1 cm. This fact is naturally associated with the higher number of barbs of the harpoons of type C – mean 13.3 barbs, and for the bilateral asymmetric tips the average is 4.5 barbs. The main difference comes from both specimens from Bikovo (Cat. №№ H 12 and H 14), which in this case are with extreme values but even if we separate them from the examined sample, the average number of barbs for the harpoons of type C remains larger – 6 barbs. We can conclude that the barbed points of type C compared to type B are characterized by a larger number of barbs closed to the trunk and located closer to each other. The three types of harpoon heads are not associated with a specific shape of the barbs or the proximal part.

At this stage of the research, the observed differences between the main types of Late Chalcolithic harpoons from Bulgaria are not sufficient grounds to say that there are certain differences between the types in the way they were used.

### Comparison of the sites' assemblages

When analyzing and comparing the data for each individual type it is easy to notice that the dimensions of the finds of certain sites are manifested as extreme. This made it necessary to verify the hypothesis whether there are actual differences between harpoons from different geographic areas.

Almost all of the studied harpoon heads are found in Northern Bulgaria (*Fig. 1*). According to their number we can divide the sites into three groups: 1. Rousse tell (at least 79 specimens<sup>4</sup>); 2. Durankulak tell – Golemia ostrov (5 specimens), Hotnitsa tell (4 specimens) and Bikovo tell (4 specimens) and 3. All other sites – one specimen per site. In this way Rousse tell stands out as a place where these weapons had a very important role in the life of the prehistoric population. In the other settlements, one could propose that only a few members of the community used harpoons as a fishing tool.

Since only in half of the examined sites a single barbed point is documented, we cannot be completely sure in the conclusions in regards to the typological distribution within the separate settlement assemblages (*Fig. 10*). Nevertheless, several important observations should be made. First, in the settlement mound near Bikovo, only unilateral (type A) or bilateral symmetrical tips (type C) are found, i.e. the most common type of Late Chalcolithic harpoons is not attested. In all other settlements where more than one harpoon was found, the bilateral asymmetric barbed points together with bilateral symmetrical barbed points are documented. Another interesting fact is that bilateral symmetric tips with open barbs (subtype C. 3.) are found only in Rousse tell and the only bilateral asymmetric tip with closed barbs (B. 1.) is from Golyamo Delchevo. The most important phenomenon is that the subtypes with closed barbs are more common in the collections of Bikovo, Hotnitsa and Golyamo Delchevo. Those characteristics show us that there is a greater or lesser degree of typological difference between the assemblages of the sites. The

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<sup>4</sup> This is the minimum number of the excavated harpoons from this site. The author did not have the opportunity to work with the collection of Rousse tell, that are stored in the National Museum of History – Sofia and in the National Archaeological Institute with Museum at the Bulgarian Academy of Sciences, so the exact number of harpoons found in this site remains incomplete.

subtypes with more open barbs are a typical peculiarity for the assemblage of Rousse tell and that looks like a local tradition.

The above differences between the assemblages of the sites are also supported when comparing the features with metric values. One of the first and easily distinguished differences is in the thickness – the harpoons from Rousse and Durankulak are about two times thicker than the barbed points from Hotnitsa, Bikovo and Golyamo Delchevo (*Fig. 11*). Another significant difference is the number of the barbs – harpoons from the southern sites have a greater number of barbs than their typological equivalents found in the northern settlements (*Fig. 12*). The tips from Hotnitsa and Golyamo Delchevo are distinguished by the long shaft zone of the harpoon head (*Fig. 13*). The first one of them is equipped with protuberances similar to those from other sites, but the distance to the proximal end is too large and this shows us a different tradition in the manufacture of this type of weapons.

Based on all of the above differences, we can postulate that two geographic groups are formed, the harpoon heads of which are somewhat different. The harpoons from Rousse and Durankulak on the one hand; and on the other hand, those from within the country (Bikovo, Golyamo Delchevo, Hotnitsa). The first group we will name *Northern (Rousse) group*, and the second we will call *Southern group* because the points of this group are found in settlements from within the country – to the south of the Danube, close to smaller riverine basins. Although we do not have the size of the tip from Nevski tell (Cat. № H 1), according to the presented drawing it seems that it refers to the Northern group. Additional similarity of the assemblages of Hotnitsa with the Southern group of barbed points, is the presence of a tip whose proximal part is equipped with two perforations (Чохаджиев, Чохаджиев 2013, 75) – similar to tip Cat. № H 14 from Bikovo. Each of the settlements in the second group is distinguished by the unique harpoon heads that for now are without an analogue in another site.

From the aforementioned comparisons we can summarize that the Northern group is characterized with more robust points that are thick and equipped with 4 – 6 open barbs. Harpoons from the Southern group are thin and equipped with a larger number of small barbs which are located closer to the trunk of the tip. Of course, there is no

sharp borderline between the two groups and it is normal to expect the mixing of elements from them in a settlement.

### **Function of the Late Chalcolithic harpoons from Bulgaria**

The use of the prehistoric barbed point as part of the specific instrument “harpoon” is frequently questioned. The fluctuations are mainly caused by the comparison with the ethnographic data (mostly from North and South America). The scientific research strives to define the criteria according to which a particular type of barbed points (found in archaeological context) can be identified as a part of a harpoon (**Weniger 1992; 2000; Pétillon 2009; Mărgărit, Popovici, Vlad 2010**, 42 – 44; **Estévez, Vila 2013; Christensen, Legoupil, Pétillon 2016**). Jean-Marc Pétillon links the term “harpoon” not with a certain shape but with the mode of operation of the weapon. He points out that the main aim of that weapon is to avoid the loss of the hooked animal. Therefore, the harpoon always has a tip which should remain stuck in the prey and to be directly or indirectly attached to the hunter or other “drag”. (**Pétillon 2009**, 77). The proposed definition seems completely acceptable and is used below as a pivot point when analysing the presented tips.

The production of a barbed point which has a complex shape with different elements requires access to a suitable raw material, very good experience and skills in its processing, but also hard work and time. Such large investment is typical for the objects with special function and/or importance, and proceeding from this thesis, we should assume that the Late Chalcolithic harpoons are produced with a precisely defined purpose. It is considered that the only role of the shaped barbs is to keep the tip in the body of the animal in order for its detention and not to contribute to more abundant bleeding and killing it more easily (see **Детев 1954**, 166 – 168). The second important feature of the harpoon heads is their connection with the hunter. This can be established in several ways. The main problem for the researchers is to determine which types of tips were immovably attached to the wooden shaft, and which were attached to allow a certain amount of mobility. The barbed points whose proximal part is equipped with protuberances were most likely detachable. The protuberances give an excellent ability to bind a rope and the area

under them near proximal end itself is extremely burnished (even polished) probably due to the constant friction in the wood shaft's socket. However, these protrusions may also exist with the fixed tips and their purpose is to prevent splitting of the shaft after an impact (cf. **Mărgărit, Popovici, Vlad 2010**, 43). The harpoon heads with grooves or perforations in the proximal part are also well suited for strapping but it cannot be established whether they have been attached in a mobile or immobile way. Similar is the situation with the tips the proximal part of which is not additionally shaped. It is more likely for them to be fixed to the shaft, but it should be considered that there is the option for a mobile attachment by means of animal tendons – similar to fishing hooks (**Στρατούλη 2008**, 18). However, the mode of binding the tip to the shaft is not a determining criterion for distinguishing the harpoons. A fixed barbed point could be a part of the “leister”, that also serves as a harpoon but the connection with the hunter is through the wooden shaft (**Pétillon 2009**, 77 – 79).

According to the functional criteria for the shape of the barbed points that are based on ethnographic examples, we must interpret Late Chalcolithic points from Bulgaria as harpoon heads or spears (cf. **Weniger 2000; Estévez, Vila 2013; Christensen, Legoupil, Pétillon 2016**). But when trying to solve the problem it should be taken into account the overall archaeological context in which the harpoons are found. An excellent example of this are the Late Palaeolithic barbed points from Western Europe where the researchers analyze and compare different data, including ethnographic. They are trying to find a link between the size of the tips, their number, archaeozoological data and the location of the sites where they are found. This way they reach to the conclusion that most likely Magdalenian barbed points were used for fishing, hunting of birds or small mammals and reject the possibility of hunting ungulates which have fallen into the aquatic environment (**Christensen, Legoupil, Pétillon 2016**, 249 – 251). On the other hand, the Iberian palaeolithic barbed points are linked to the fishing (**Estévez, Vila 2013**, 301).

In our case, it is very difficult to connect the frequency of the harpoons found with the increased exploitation of a specific animal species – in particular, fish. The number of the documented fish remains in the archaeological context depends on many factors (**Bartosiewicz,**



**Bonsall 2004**, 259 – 260). None of the excavations of the sites examined here used water-sieving to collect bones from small species such as fish. A specialized survey of the fish remains was done only for the Durankulak assemblage; however, it should be noted that the method of excavation is the main cause of the small number of fish remains (**Manhart 1998**, 197 – 200; **Heinrich 1998**). However, the presence of fish remains is documented in almost all sites: Hotnitsa (**Spasov et al. 2015**, 12, Tab. 9), Rousse (**Шкорпил 1914**, 69; **Попов 1921**, 2; **Костов 1926**, 68; **Георгиев, Ангелов 1952**, 188), Durankulak – Golemia oštrov (**Manhart 1998**, 197 – 200; **Heinrich 1998**), Golyamo Delchevo (**Тодорова и кол. 1975**, 246) and Bikovo (**Детев 1954**, 154). The connection between the type of the weapon and the prey is very well attested in the Late Chalcolithic settlements on the north (Romanian) bank of the Lower Danube – Hârşova (**Mărgărit, Popovici 2011**), Borduşani-Popină (**Mărgărit, Popovici, Vlad 2010**), Pietrele (**Benecke et al. 2013**). This example shows the important role of the fish resources as food, as well as the harpoons among the population's inventory. This connection we can accept as equivalent to situation in the Bulgarian sites and especially Rousse tell. The large number of the harpoons found corresponds to the large quantity of fish remains. Although not supported by an exact quantity, it is evident from the descriptions of the researchers who excavated the site by a different methodology and at different times.

The geographic location of the sites also shows us that most likely the Late Chalcolithic barbed points are related to fishing. The majority of harpoons are documented by the banks of the Danube River (Rousse) and the Black Sea (Durankulak – Golemia oštrov). The settlement mounds near Hotnitsa, Yunatsite (Pazardzhik Region) and Golyamo Delchevo are located in the middle/lower current of smaller or larger rivers, which were far fuller in the past. The settlement mound near Bikovo Village was located on the shores of the former marsh (called Bikovsko Blato), where up to the 20<sup>th</sup> century fishing was practiced, but today it has dried up (**Детев 1954**, 154). Rafail Popov used the site's location as an argument for the reverse hypothesis. He believed that the harpoon from Sultan (Nevski) tell was not used for fishing because the settlement is away from a large river (**Попов 1926**, 55). However, the harpooning is performed in the shallow waters in which



the fish swim close to the surface of the water, i.e. the deep waters of a big river are not a necessary condition for this type of fishing. Each of the listed places provides excellent conditions for harpoon-fishing – spring spills of the rivers, the calm and shallow waters of the Bikovsko Blato, the ancient lake northeast of Rousse (**Benecke et al. 2013**, 177 – 181), lagoons or limans near Durankulak.

The problem with the use of harpoons can also be considered from the point of view of their place in the hunting kit of the Chalcolithic hunters in comparison with the arrowheads and spears made from flint or from hard animal tissue (bone or antler). The arrow tips and spears are documented in a much larger number of settlements and larger area. They are widespread and more used than harpoons, and they are even a part of the battle outfits of prehistoric warriors (**Бояджиев 2014**). On the contrary, the limited geographical range of the harpoons suggests their narrow-specialized function in the hunting. It seems they were not part of the equipment when hunting the widespread land mammals like red deer, roe deer and wild boar.

Obviously, the Late Chalcolithic harpoon heads from Bulgaria are used for fishing, including the hunting of certain species of marine mammals. Bones from seals, dolphins and small whale were found in the Late Chalcolithic building horizons of the Durankulak – Golemia oštrov (**Manhart 1998**, 132 – 134). The experimental archaeology provides clear evidence of the possibility that seals were hunted with the use of harpoons through the prehistory (**Osipowicz 2018**). The main arguments for the fishing function of the studied tips are: the specific barbs that serve to retain the prey; the finding of the tips in settlements where fish bones are found and are located close to the areas which are suitable for this type of fishing; limited range of distribution; lack of other evidence that they have been used in the hunting of terrestrial animals or in the warfare.

As it was already mentioned, some researchers consider that the size of the harpoon head is related to the size of the hunted species (**Christensen, Legoupil, Pétilion 2016; Elliott, Little 2018**, 291 – 292). This way we can explain the differences between the harpoons of both groups – the Northern and the Southern. In the first group the harpoons are massive with several large barbs and adjusted for the fishing of large fish (sturgeons, sheatfishes, etc.) and marine mam-

mals (seals, dolphins). These points are strong enough and endure the prolonged struggle with the hit animal. It is possible that they were attached in a mobile way to the shaft of the harpoon because in this way the tension on the tip is reduced. It seems that the thin tips from the Southern group are suitable for catching smaller species or as leisters for “harvesting” in the shallow spills of rivers and lakes. Small fish are killed on the impact or at least their fight is significantly shorter, i.e. the resistance is smaller. At this stage of the research, the difference in the hunted fish species is most likely the major reasons for the shown differences between the two groups of Late Chalcolithic harpoons.

### **Conclusion**

From the point of view of the manufacturing process local technological differences between the specimens in question could not be found. The preparation of the tips started on a rectangular blank extracted from red deer antler, the outer contours of the barbs and proximal part were cut in. The selection of the used technique depended on the desired shape of the barbs.

The morphological characteristics of the studied harpoon heads from Bulgaria however show several specific differences between the assemblages of the different settlements. Two groups are formed – Northern and Southern. The first is characterized by more massive and strong tips, provided with a small number but large barbs. The tips from this group are similar and even identical to the published harpoons from the Lower Danube (**Mărgărit, Popovici, Vlad 2010**, 35 and the references). The barbed points from the second group have more barbs that are closer to the trunk; the harpoons are significantly thinner and with specific shaped elements. Probably the difference between the two groups is due to a difference in the size of the hunted species, i.e. the harpoons from the Northern Group are harder because they are designed for larger fishes and longer struggle of the prey.

Rousse tell stands out as a central site in the study of these finds in Bulgaria and even in Southeastern Europe. In this site over 80 harpoons were found and this is one of the biggest assemblages on the Lower Danube. As we have in mind the other settlements on the north bank of the Danube where also a large number of har-

poons were found, we can say that the settlements on the shores of the river are development centers of this type of fishing gear in the Late Chalcolithic. According to Georgia Stratouli its popularity in this region is due to the highly developed fishing which is prompted by the rich and diverse fish resources (**Stratouli 1996**, 16 – 17). In these settlements fishing had a significant role in the diet of the prehistoric communities and the harpoons respectively were one of the most important hunting weapons. The reasons for the spreading of the barbed points throughout the country cannot be clarified yet. For now, there are two possible explanations: the need for more food (additional sources of subsistence other than the traditional) or the need for different food (diversification of the diet; fish can also be a luxury product – subject of trade).

Another important aspect is the evolution of the harpoon heads within the Neo-Chalcolithic cultural complex in the Balkans but due to the large quantitative imbalance between the finds from the different periods, it is impossible at this stage of the research to trace this process.

The study of prehistoric harpoon points from Bulgaria is still in its infancy. The conclusions are based on a limited database and some of the questions themselves remain unclear. Hopefully, the place of harpoons in the life of prehistoric communities in Southeastern Europe will become more detailed and fully disclosed with the accumulation of further finds and the expansion of interdisciplinary studies.

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Table 1. Catalogue of the Late Chalcolithic harpoons from Bulgaria (courtesy of D. Markov)

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 1</b>	-	Sultan (Nevski)	B. 2.	-/-/-	<b>Попов 1926</b> , 55, обр. 3: 6
<b>H 2</b>	-	Hotnitsa	B. 3.	7.3/1.7/0.5 Fragmented	<b>Чохаджиев, Еленски 2002</b> , 29, обр. 3: 4
<b>H 3</b>	-	Hotnitsa	C. 1.	15.5/2.5/- Fragmented	<b>Чохаджиев, Чохаджиев 2010</b> , 82, обр. 3: 4
<b>H 4</b>	-	Hotnitsa	-	-/-/-	<i>Mentioned in:</i> <b>Чохаджиев, Чохаджиев 2013</b> , 75
<b>H 5</b>	-	Hotnitsa	-	-/-/-	<i>Mentioned in:</i> <b>Чохаджиев и кол. 2014</b> , 85
<b>H 6</b>	B-0867 Green Train. Center – Shabla	Durankulak – Golemia oštrov	B. 3.	14.8/3.1/1.0	<i>Unpublished</i>
<b>H 7</b>	HCФ 1861 Dobrich RMH*	Durankulak – Golemia oštrov	C. 2.	-/3.2/0.9 Fragmented	<i>Unpublished</i>
<b>H 8</b>	HCФ 2874 Dobrich RMH	Durankulak – Golemia oštrov	Proximal part	-/-/- Fragmented	<i>Unpublished</i>

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 9</b>		Durankulak – Golemia oštrov	C	-/-/- Fragmented	<b>Зидаров 2001</b> ( <i>Unpublished</i> )
<b>H 10</b>	Ап 0168 Dobrich RMH	Durankulak – Golemia oštrov	C. 2.	18.3/3.0/1.0	<i>Unpublished</i>
<b>H 11</b>	-	Bikovo	C. 1.	7.5/2.4/0.5	<b>Тодорова 1986,</b> сн. 69
<b>H 12</b>	-	Bikovo	C. 2.	16.0/3.0/0.7	<b>Тодорова 1986,</b> сн. 69
<b>H 13</b>	-	Bikovo	A. 1.	16.5/2.5/0.5	<b>Тодорова 1986,</b> сн. 69
<b>H 14</b>	-	Bikovo	C. 1.	20.0/3.0/0.5	<b>Тодорова 1986,</b> сн. 69
<b>H 15</b>	4004 Varna RMH	Golyamo Delchevo	B. 1.	25.5/2.3/0.7	<i>Re-examined</i> <b>Тодорова и кол. 1975, 211,</b> табл. 99; 32
<b>H 16</b>	-	Yunatsite	-	-	<i>Personal information</i>
<b>H 17</b>	2877 Rousse RMH	Rousse	Proximal part	6.2/3.8/1.7 Fragmented	<i>Unpublished</i>

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 18</b>	2311 Rousse RMH	Rousse	Proximal part	9.0/3.6/1.0 Fragmented	<i>Unpublished</i>
<b>H 19</b>	2309 Rousse RMH	Rousse	Proximal part	9.4/3.0/1.9 Fragmented	<i>Unpublished</i>
<b>H 20</b>	2308 Rousse RMH	Rousse	Proximal part	8.1/2.0/1.2 Fragmented	<i>Unpublished</i>
<b>H 21</b>	2307 Rousse RMH	Rousse	Proximal part	8.3/3.1/1.3 Fragmented	<i>Unpublished</i>
<b>H 22</b>	1211 Rousse RMH	Rousse	Proximal part	5.0/4.0/1.2 Fragmented	<i>Unpublished</i>
<b>H 23</b>	1149 Rousse RMH	Rousse	Proximal part	7.0/2.0/0.9 Fragmented	<i>Unpublished</i>
<b>H 24</b>	1148 Rousse RMH	Rousse	Proximal part	8.2/3.5/1.0 Fragmented	<i>Unpublished</i>
<b>H 25</b>	548 Rousse RMH	Rousse	Proximal part	8.8/2.0/0.7 Fragmented	<i>Unpublished</i>

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 26</b>	1218 Rousse RMH	Rousse	C. 1.	12.0/3.6/0.8 Fragmented	<i>Re-examined;</i> <b>Георгиев, Ангелов 1952,</b> 134, обр. 104
<b>H 27</b>	1263 Rousse RMH	Rousse	C	9.2/2.4/1.0 Fragmented	<i>Unpublished</i>
<b>H 28</b>	1296 Rousse RMH	Rousse	C. 2.	11.8/3.8/1.4 Fragmented	<i>Unpublished</i>
<b>H 29</b>	1325 Rousse RMH	Rousse	B. 3.	10.4/3.5/1.1 Fragmented	<i>Unpublished</i>
<b>H 30</b>	1524 Rousse RMH	Rousse	C	11.5/3.5/1.1 Fragmented	<i>Unpublished</i>
<b>H 31</b>	1842 Rousse RMH	Rousse	B. 3.	12.0/3.4/0.7 Fragmented	<i>Unpublished</i>
<b>H 32</b>	1895 Rousse RMH	Rousse	B. 3.	11.9/2.7/1.1 Fragmented	<i>Unpublished</i>

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 33</b>	1899 Rousse RMH	Rousse	C	10.8/2.5/1.0 Unfinished	<i>Unpublished</i>
<b>H 34</b>	1939 Rousse RMH	Rousse	C. 3.	12.2/3.6/1.5 Fragmented	<i>Re-examined; Георгиев, Ангелов 1952, 134, обр. 104</i>
<b>H 35</b>	1359 Rousse RMH	Rousse	B. 3.	7.2/2.8/1.0 Fragmented	<i>Unpublished</i>
<b>H 36</b>	2301 Rousse RMH	Rousse	B	15.0/3.8/1.6 Fragmented	<i>Unpublished</i>
<b>H 37</b>	2514 Rousse RMH	Rousse	C	15.6/3.7/1.4 Fragmented	<i>Unpublished</i>
<b>H 38</b>	2824 Rousse RMH	Rousse	C	9.0/3.3/1.3 Fragmented	<i>Unpublished</i>
<b>H 39</b>	3177 Rousse RMH	Rousse	B	18.7/2.4/1.4 Fragmented	<i>Unpublished</i>

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 40</b>	5680 Rousse RMH	Rousse	B	12.4/3.4/1.0 Fragmented	<i>Unpublished</i>
<b>H 41</b>	588 Rousse RMH	Rousse	A	16.6/3.9/1.2 Fragmented	<i>Re-examined;</i> <b>Георгиев, Ангелов 1957,</b> 67, обр. 28; 2
<b>H 42</b>	1141 Rousse RMH	Rousse	B	15.6/3.1/2.0 Fragmented	<i>Unpublished</i>
<b>H 43</b>	1150 Rousse RMH	Rousse	B. 3.	15.3/2.9/1.4 Fragmented	<i>Re-examined;</i> <b>Георгиев, Ангелов 1952,</b> 134, обр. 104
<b>H 44</b>	1151 Rousse RMH	Rousse	B	19.3/3.9/1.6 Fragmented	<i>Unpublished</i>
<b>H 45</b>	1197 Rousse RMH	Rousse	B. 3.	10.3/3.2/1.4 Fragmented	<i>Unpublished</i>
<b>H 46</b>	1174 Rousse RMH	Rousse	B. 3.	10.5/3.4/1.0 Fragmented	<i>Unpublished</i>



Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 47</b>	527 Rousse RMH	Rousse	Proximal part	10.0/3.4/1.4 Fragmented	<i>Unpublished</i>
<b>H 48</b>	500 Rousse RMH	Rousse	Proximal part	5.7/3.4/1.4 Fragmented	<i>Unpublished</i>
<b>H 49</b>	499 Rousse RMH	Rousse	Proximal part	10.3/2.9/1.4 Fragmented	<i>Unpublished</i>
<b>H 50</b>	504 Rousse RMH	Rousse	-	9.2/2.0/1.4 Fragmented	<i>Unpublished</i>
<b>H 51</b>	1134 Rousse RMH	Rousse	-	6.1/1.7/0.6 Fragmented	<i>Unpublished</i>
<b>H 52</b>	1173 Rousse RMH	Rousse	B. 3.	10.0/4.0/1.4 Fragmented	<i>Unpublished</i>
<b>H 53</b>	1198 Rousse RMH	Rousse	B. 3.	11.7/3.6/1.4 Fragmented	<i>Re-examined;</i> <b>Георгиев, Ангелов 1952,</b> 134, обр. 104
<b>H 54</b>	1262 Rousse RMH	Rousse	Proximal part	9.3/1.7/1.5 Fragmented	<i>Unpublished</i>

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 55</b>	2878 Rousse RMH	Rousse	C	7.9/3.3/1.4 Fragmented	<i>Unpublished</i>
<b>H 56</b>	1523 Rousse RMH	Rousse	C. 3.	18.9/4.0/1.0	<i>Re-examined;</i> <b>Георгиев, Ангелов 1952,</b> 134, обр. 105; 1
<b>H 57</b>	1826 Rousse RMH	Rousse	B. 2.	12.3/2.2/0.9 Fragmented	<i>Unpublished</i>
<b>H 58</b>	3059 Rousse RMH	Rousse	B. 3.	15.0/3.7/1.4	<i>Re-examined;</i> <b>Чернаков 2009,</b> 53, кат. № 27
<b>H 59</b>	3476 Rousse RMH	Rousse	C. 3.	19.4/3.8/1.6	<i>Re-examined;</i> <b>Чернаков 2009,</b> 53, кат. № 26
<b>H 60</b>	5873 Rousse RMH	Rousse	C	20.2/3.2/1.6 Unfinished	<i>Unpublished</i>
<b>H 61</b>	33 EM – DFBC** Tutrakan	Rousse	B. 3.	9.8/3.7/1.1 Fragmented	<i>Re-examined;</i> <b>Георгиев, Ангелов 1952,</b> 134, обр. 104

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 62</b>	42 EM – DFBC Tutrakan	Rousse	B. 2.	24.4/4.2/1.4 Fragmented	<i>Unpublished</i>
<b>H 63</b>	1102 EM – DFBC Tutrakan	Rousse	B. 2.	13.7/3.8/1.4 Fragmented	<i>Re-examined;</i> <b>Костов 1926</b> , 60, обр. 105; в
<b>H 64</b>	-	Rousse	C. 1.	19.6/3.4/0.8	<b>Георгиев, Ангелов 1952</b> , 134, обр. 105; 2
<b>H 65</b>	-	Rousse	B. 2.	17.2/3.4/1.1	<b>Георгиев, Ангелов 1952</b> , 134, обр. 105; 3
<b>H 66</b>	-	Rousse	B. 2.	19.7/4.4/1.7	<b>Георгиев, Ангелов 1957</b> , 67, обр. 28; 3
<b>H 67</b>	-	Rousse	B	20.7/4.4/0.9 Unfinished	<b>Георгиев, Ангелов 1957</b> , 67, обр. 28; 4
<b>H 68</b>	-	Rousse	B. 3.	23.4/3.5/-	<b>Георгиев, Ангелов 1957</b> , 67, обр. 28; 5
<b>H 69</b>	I. 277 Varna RMH	Rousse	B	24.1/4.5/1.8 Fragmented	<i>Re-examined;</i> <b>Славчев 2005</b> , 13, образец 1; 7

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 70</b>	I. 58 Varna RMH	Rousse	Proximal part	11.8/3.5/1.4 Fragmented	<i>Re-examined;</i> <b>Славчев 2005</b> , 13, образец 1: 8
<b>H 71</b>	-	Rousse	B	9.0/2.5/- Fragmented	<b>Шкорпил 1914</b> , табл. IX, фиг. 65: 2
<b>H 72</b>	-	Rousse	C. 2.	24.0/3.6/-	<b>Костов 1926</b> , 60, обр. 105: а
<b>H 73</b>	-	Rousse	B. 2.	18.5/2.8/-	<b>Костов 1926</b> , 60, обр. 105: б
<b>H 74</b>	-	Rousse	B. 2.	9.1/2.4/- Fragmented	<b>Костов 1926</b> , 60, обр. 105: г
<b>H 75</b>	-	Rousse	Proximal part	10.0/2.7/- Fragmented	<b>Костов 1926</b> , 60, обр. 105: д
<b>H 76</b>	-	Rousse	Proximal part	10.8/3.1/- Fragmented	<b>Костов 1926</b> , 60, обр. 105: е
<b>H 77</b>	-	Rousse	Proximal part	-/-/- Fragmented	<b>Георгиев, Ангелов 1952</b> , 134, обр. 104
<b>H 78</b>	-	Rousse	Proximal part	-/-/- Fragmented	<b>Георгиев, Ангелов 1952</b> , 134, обр. 104
<b>H 79</b>	-	Rousse	Proximal part	-/-/- Fragmented	<b>Георгиев, Ангелов 1952</b> , 134, обр. 104

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 80</b>	-	Rousse	Proximal part	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 81</b>	-	Rousse	B. 3.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 82</b>	-	Rousse	B. 3.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 83</b>	-	Rousse	B. 2.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 84</b>	-	Rousse	B. 3.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 85</b>	-	Rousse	B. 2.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 86</b>	-	Rousse	B. 2.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 87</b>	-	Rousse	C. 2.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 88</b>	-	Rousse	-	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 89</b>	-	Rousse	C. 2.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 90</b>	-	Rousse	C. 3.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 91</b>	-	Rousse	C. 2.	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104
<b>H 92</b>	-	Rousse	C	-/-/- Fragmented	Георгиев, Ангелов 1952, 134, обр. 104

Cat. №	Inv. №	Site	Type	Dimension (length/width/thick.) in centimeters	Reference
<b>H 93</b>	-	Rousse	B	-/-/- Fragmented	<b>Георгиев, Ангелов 1952,</b> 134, обр. 104
<b>H 94</b>	-	Rousse	B	-/-/- Fragmented	<b>Георгиев, Ангелов 1952,</b> 134, обр. 104
<b>H 95</b>	-	Rousse	B. 3.	-/-/- Fragmented	<b>Георгиев, Ангелов 1952,</b> 134, обр. 104

\*RMH: Regional Museum of History

\*\*EM – DFBC; Ethnographic Museum – Danube Fishing and Boat Construction

Table. 2. Values of the main dimensions of the harpoon heads (courtesy of D. Markov)

	Length (cm)			Width (cm)			Thickness (cm)			Number of barbs			Distance between the barbs (cm)		
	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
type <b>A</b>	16.6	16.6	16.6	2.5	2.5	2.5	0.5	1.2	0.9	1	11	6	0.6	0.6	0.6
type <b>B</b>	14.8	23.4	18.1	1.7	4.5	3.2	0.5	2.0	1.3	2	7	5	2.3	6.8	4.1
type <b>C</b>	18.9	24.0	20.6	2.4	4.0	3.3	0.5	1.6	1.1	4	60	13	0.5	4.9	2.8

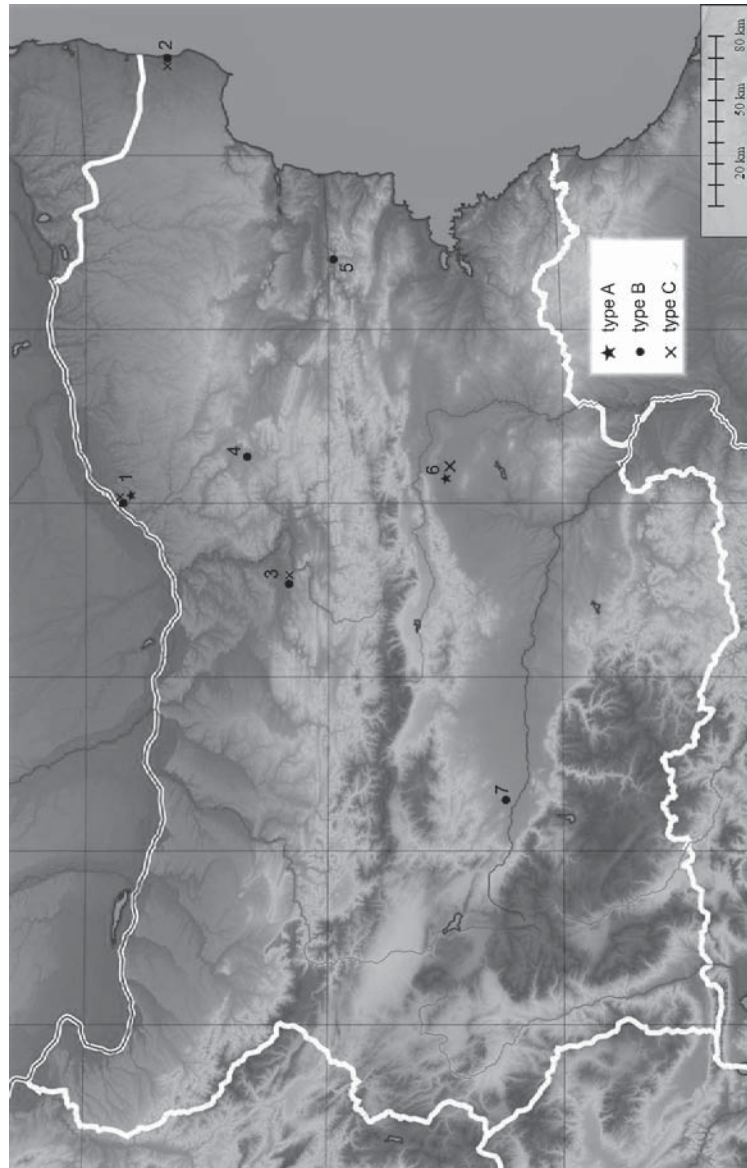


Fig. 1. Map of the archaeological sites which have yielded harpoon heads:

1. Rousse; 2. Durankulak; 3. Hotnitsa; 4. Sultan (Nevski); 5. Golyamo Delchevo;
6. Bikovo; 7. Yunatsite (courtesy of D. Markov)



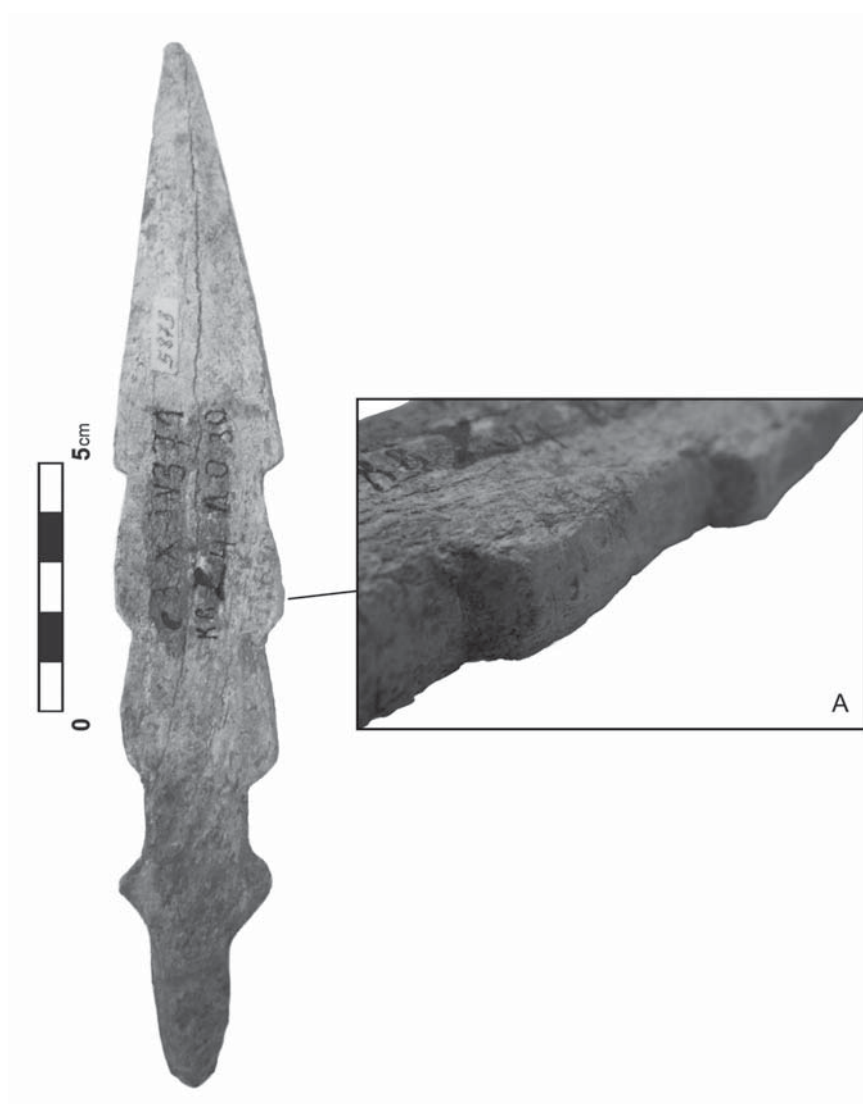


Fig. 2. Cat. № H 60, unfinished harpoon point: A – detail of the two-way roughly cutting of the barb (photographer: D. Markov)

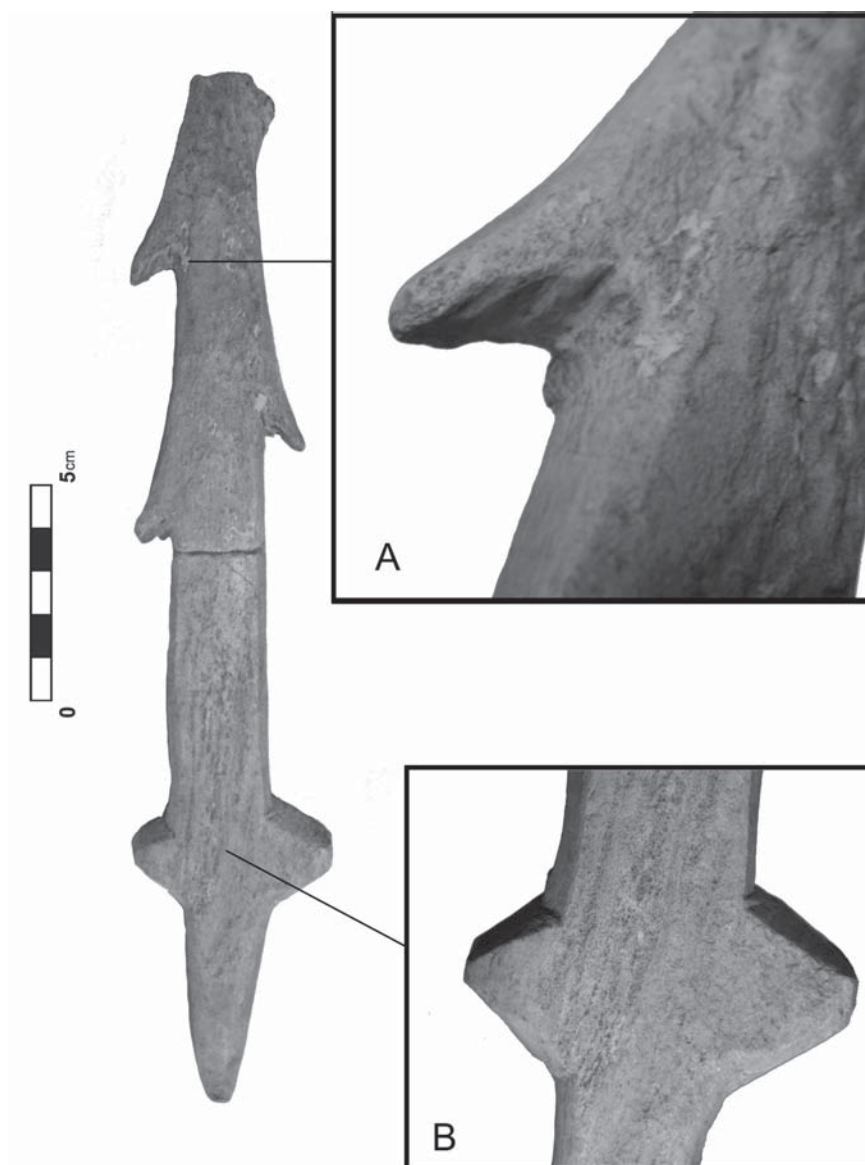


Fig. 3. Cat. № H 69: A – traces of working, showing the strokes from a chisel; B – detail from the shaping of the protuberances (photographer: D. Markov)

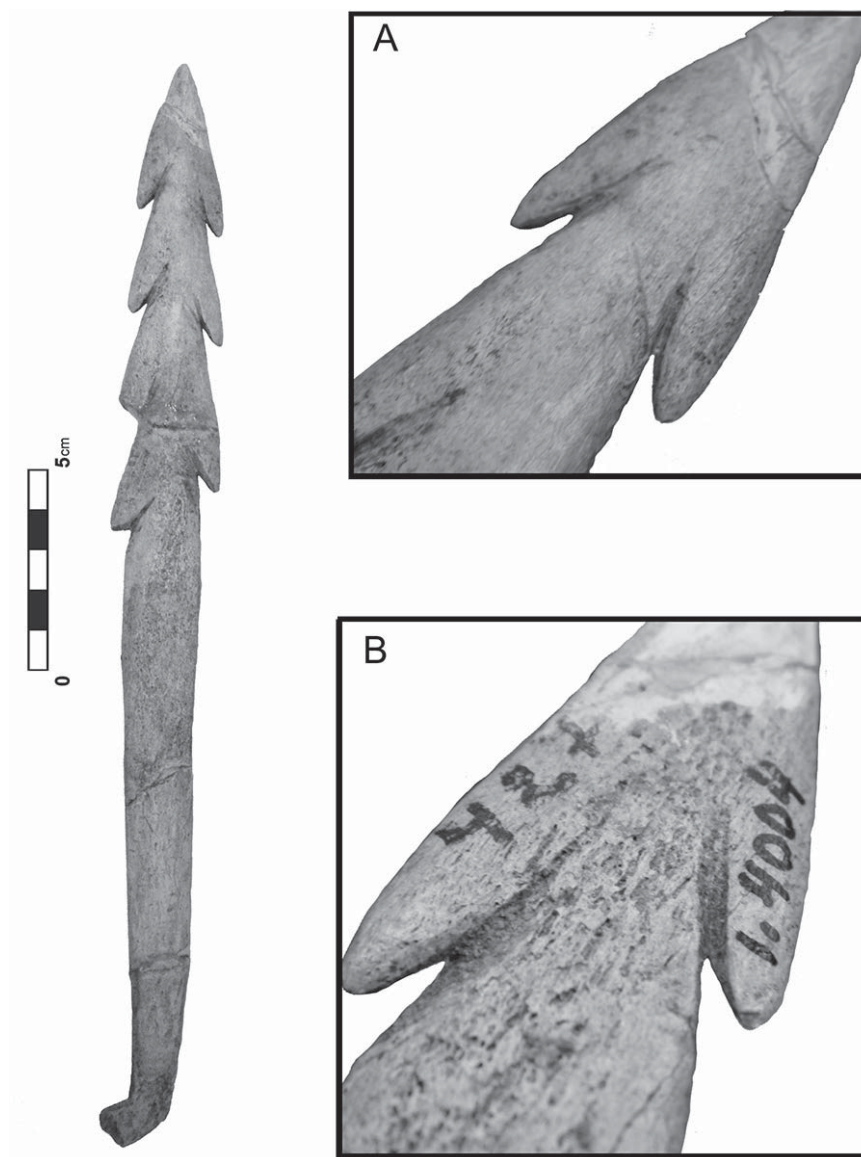


Fig. 4. Cat. № H 15: A – cut marks made by a flint tool on the upper side; B – cut marks made by a flint tool on the bottom side (photographer: D. Markov)

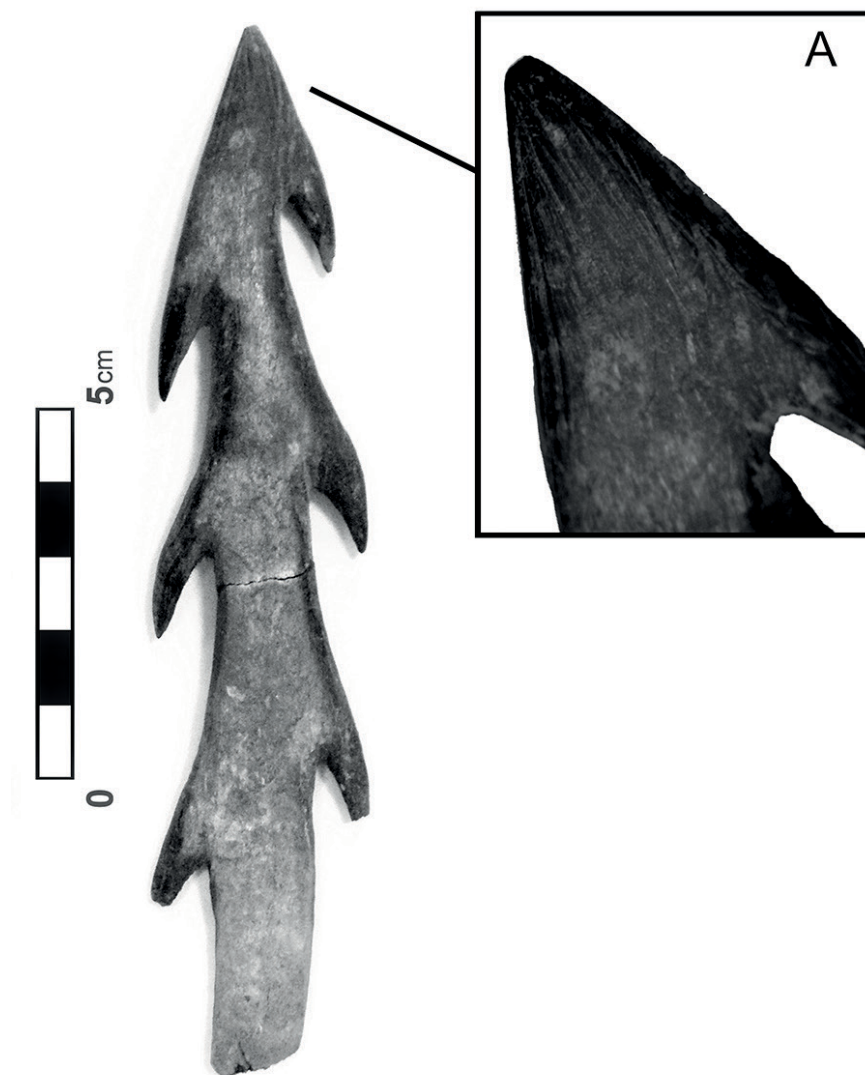


Fig. 5. Cat. № H 6: A – traces of scraping from a flint tool  
(photographer: D. Markov)

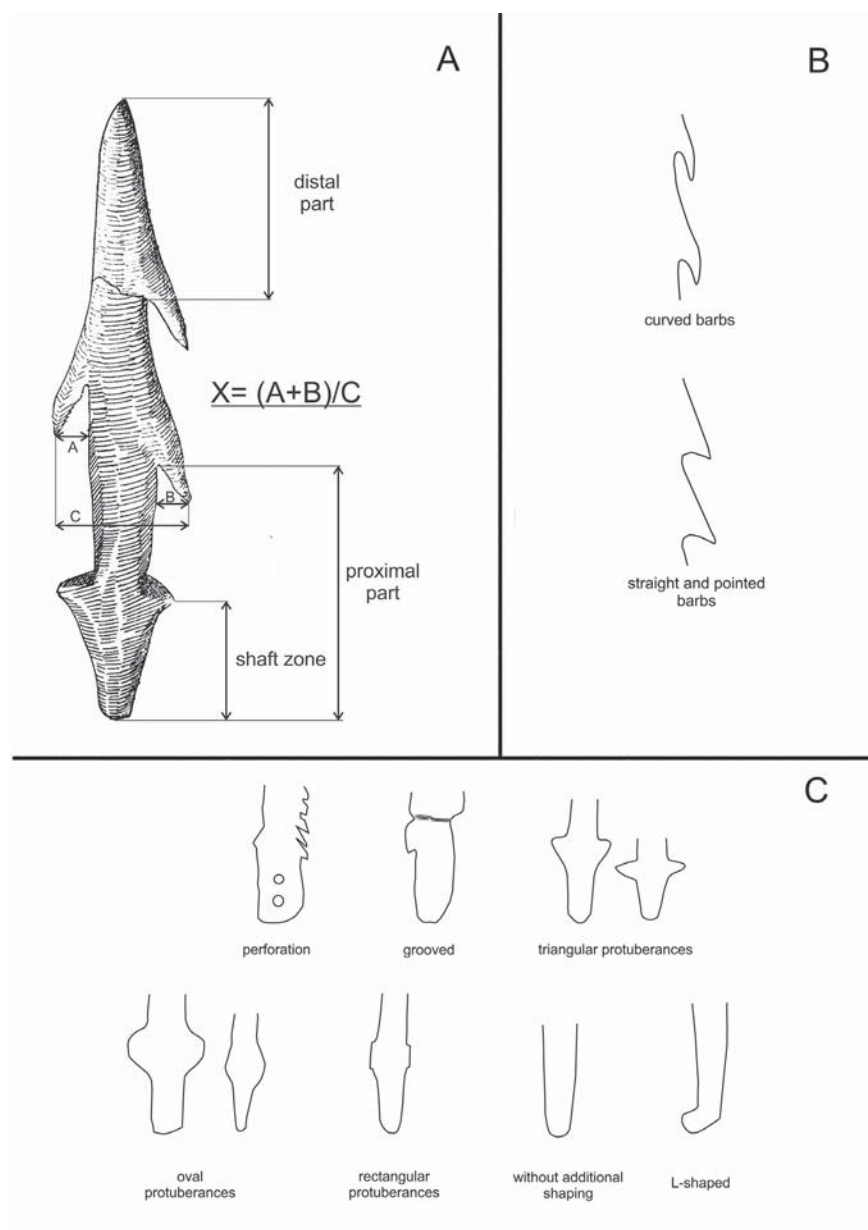


Fig. 6. A – measurements of the barb zone and other main parts of the point; B – the types of the barbs; C – the types of the proximal part (illustrator: D. Markov)



Fig. 7. Harpoons from Bikovo: Cat. № H 13 – subtype A. 1.;  
Cat. №№ H 11 and H 14 – subtype C. 1.;  
Cat. № H 12 – subtype C. 2.  
(after **Тодорова 1986**, сн. 69; adapted by D. Markov)

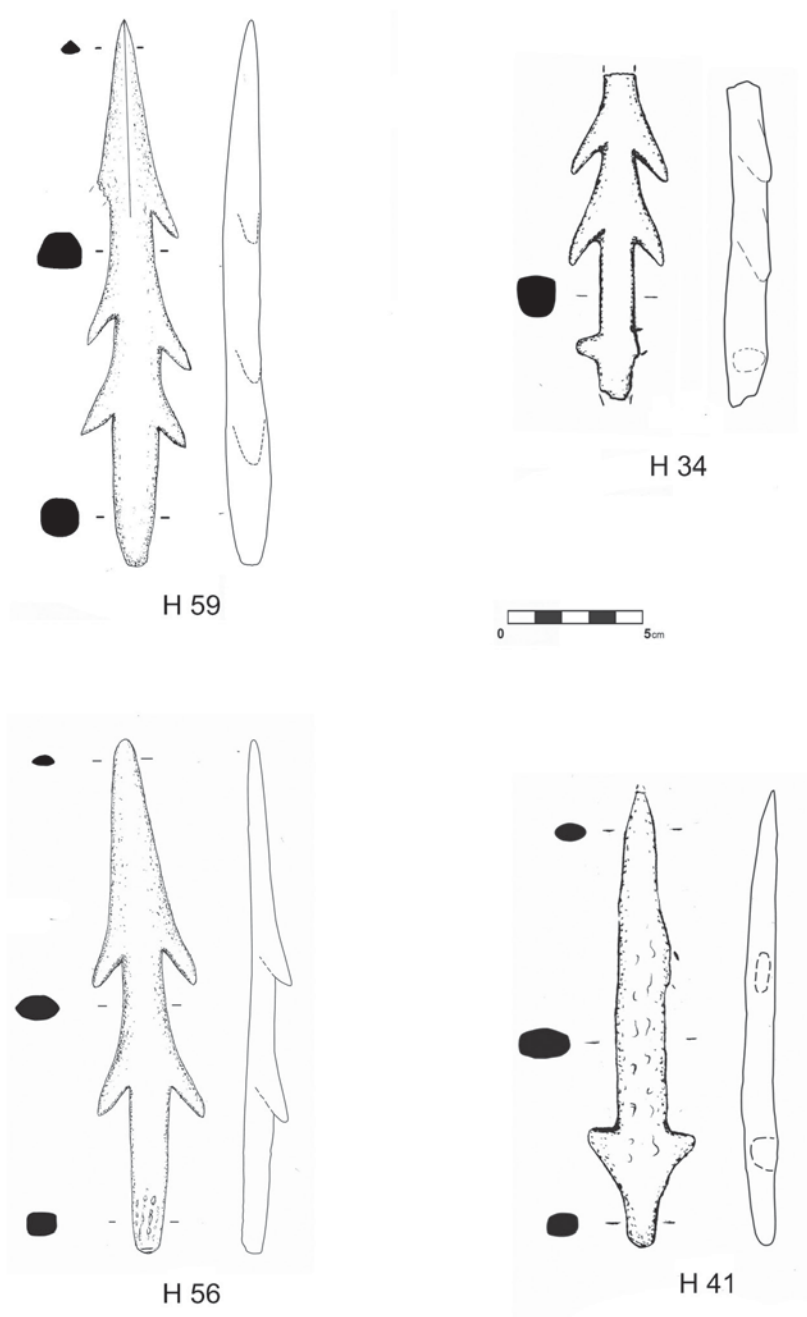


Fig. 8. Harpoons from Rousse: Cat. № H 41 – type A; Cat. №№ H 34, H 56 and H 59 – subtype C. 3. (illustrator: D. Markov)

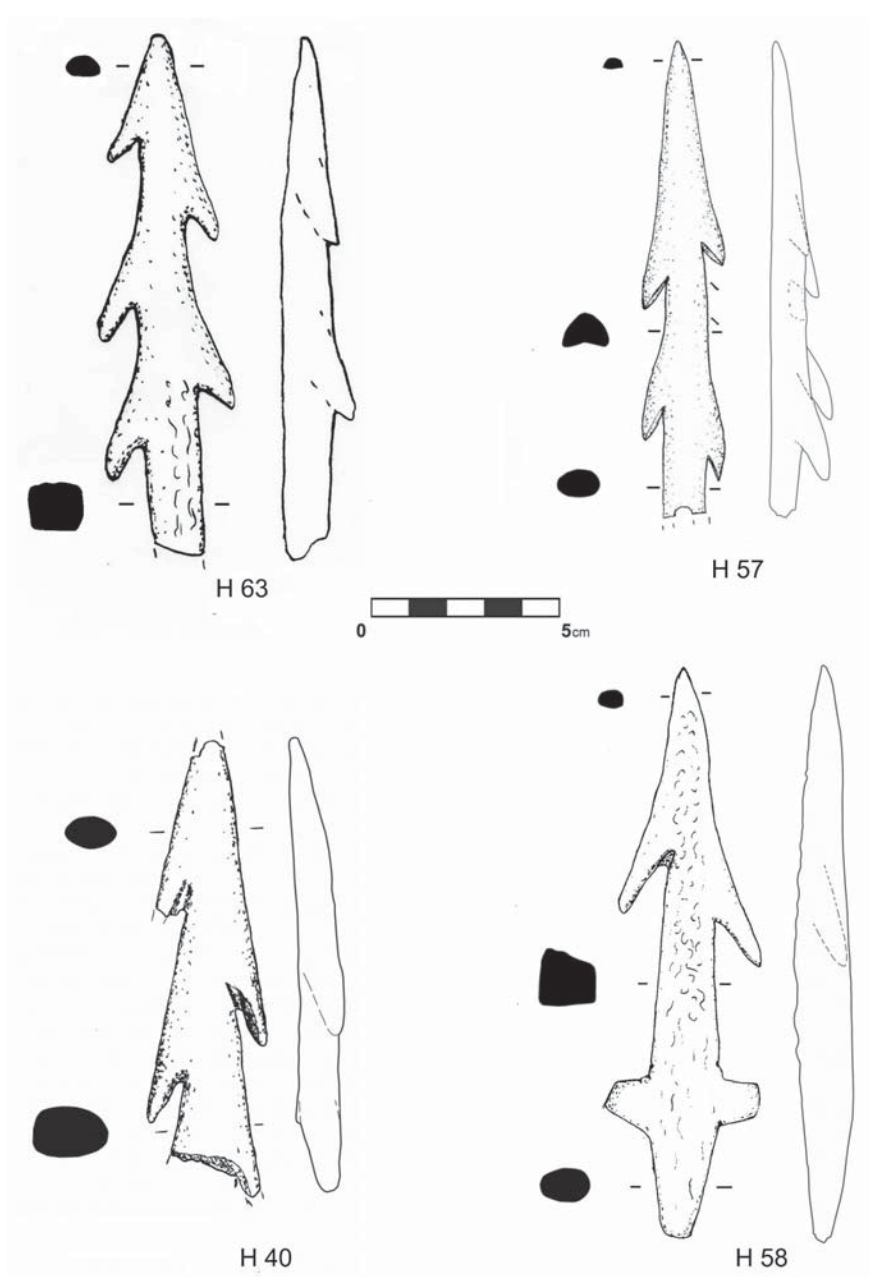


Fig. 9. Harpoons from Rousse: Cat. № H 40 – possible subtype B. 1.;  
Cat. №№ H 57 and H 63 – subtype B. 2.; Cat. № H 58 – subtype B. 3.  
(illustrator: D. Markov)



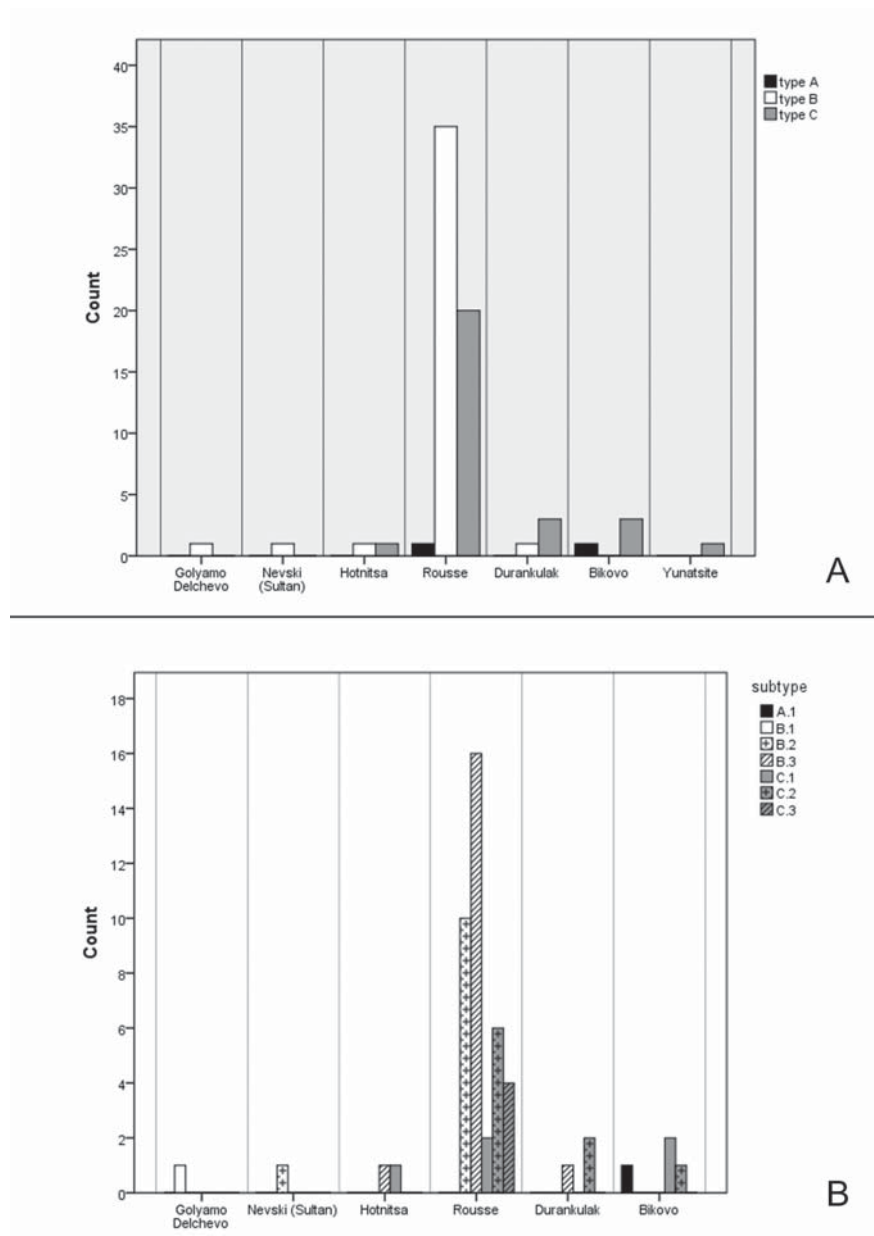


Fig. 10. Distribution of types (A) and subtypes (B) (courtesy of D. Markov)

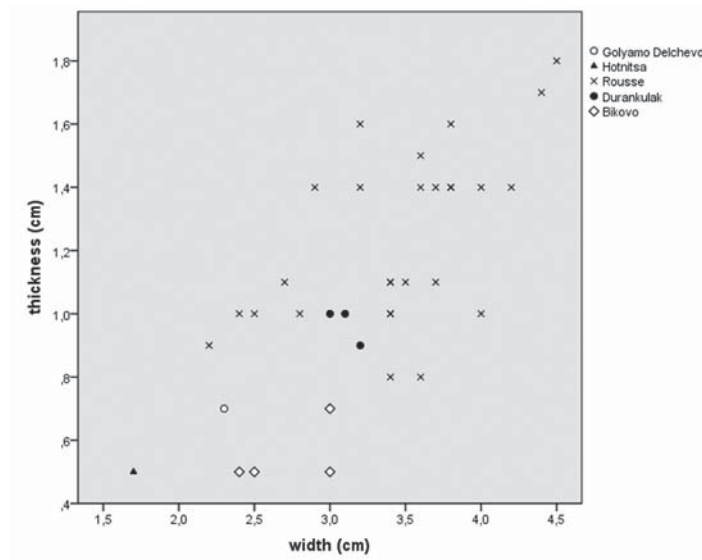


Fig. 11. Relationship between the thickness and the width of the harpoon heads (courtesy of D. Markov)

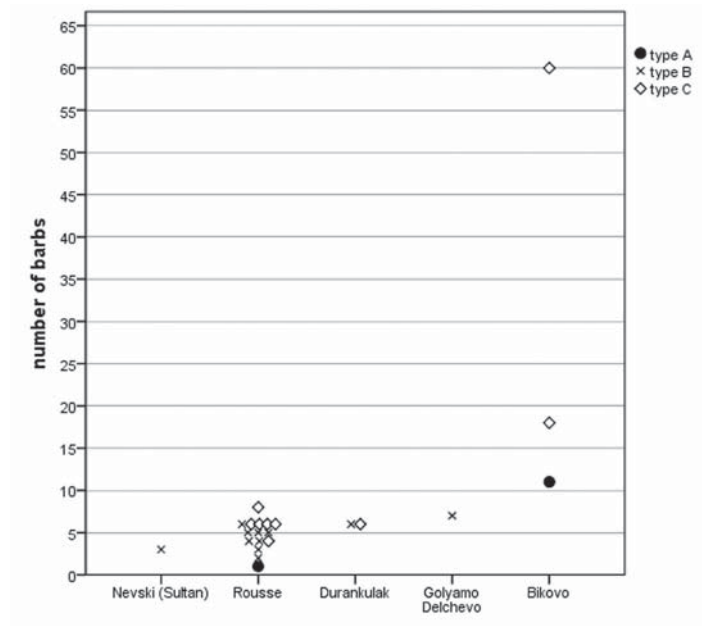


Fig. 12. Distribution of the *Number of the barbs* (courtesy of D. Markov)

