

ENEOLITHIC AND EARLY BRONZE AGE BIRDS FROM THE SUNKEN SETTLEMENT AT THE SOZOPOL BAY (BULGARIAN BLACK SEA COAST)

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Notwithstanding the Holocene remains of birds are most numerous in Bulgaria, they are still very poorly studied (Boev, 1992; Боев, 1991). Most of our scanty data concern various Neolithic to the Medieval archaeological sites. Several settlements from Neolithic, Eneolithic and Bronze Age have been established at the mouths of rivers of the Bulgarian Black Sea coast, but we have information about the significance of birds for their inhabitants for only one of them — the sunken Early Bronze Age settlement in the Kyten bay, near the medieval fortress Urdoviza (Боев, Рибаров, 1990). The bird bone remains, collected during the submarine archaeological excavations in 1987—1990 at the Sozopol bay, are discussed in this paper.

MATERIAL AND METHODS

The total amount of bone material of birds comprises of 203 bones and bone fragments (table 1). The material is dated "Eneolithic — Early Bronze Age" (5000 — 4000 years B.C.) by the organizer of excavations — Dr Mikhail Lazarov. The remains of total of 59 individuals of birds have been collected. The minimal number of individuals (MNI) (table 1) is estimated having in mind the dimensional and age differences of bones also. A small part of the remains (13 bones; 6,4 percent) remain undetermined because of their fragmentation or insufficient comparative material. This concerns and 58 bones of ducks and diving ducks also (table 1). The finds originate from twelve squares: C-29, C-34, C-40, C-41, C-51, C-82, C-88, C-146, C-206, C-213, and C-417. The squares C-82, C-88, C-146, C-206 and C-213 are dated "Eneolithic", while the rest are dated "Early Bronze Age".

The bone finds are identified by comparison of samples of the osteological bird collection of the Zoological Department of the National Museum of Natural History in Sofia. They have file numbers: 38—39; 4422—4446 and 4457—4633 and are kept in the District Museum of History in Jambol.

ENVIRONMENTAL CONDITIONS

The convenient and wide Sozopol bay, the Sozopol Peninsula and the four islands in the vicinity of it (St. Cyril, St. Ivan, St. Peter, and St. Todor) are the main geographical preconditions for the choice of place of the ancient settlement. The temperate climate (the average annual temperature is 13,3°C, and the average annual amplitude of temperature is 20,6°C) is characteristic by its autumn precipitation maximum and summer precipitation minimum (Аноним., 1988). The winter in the region is the warmest one

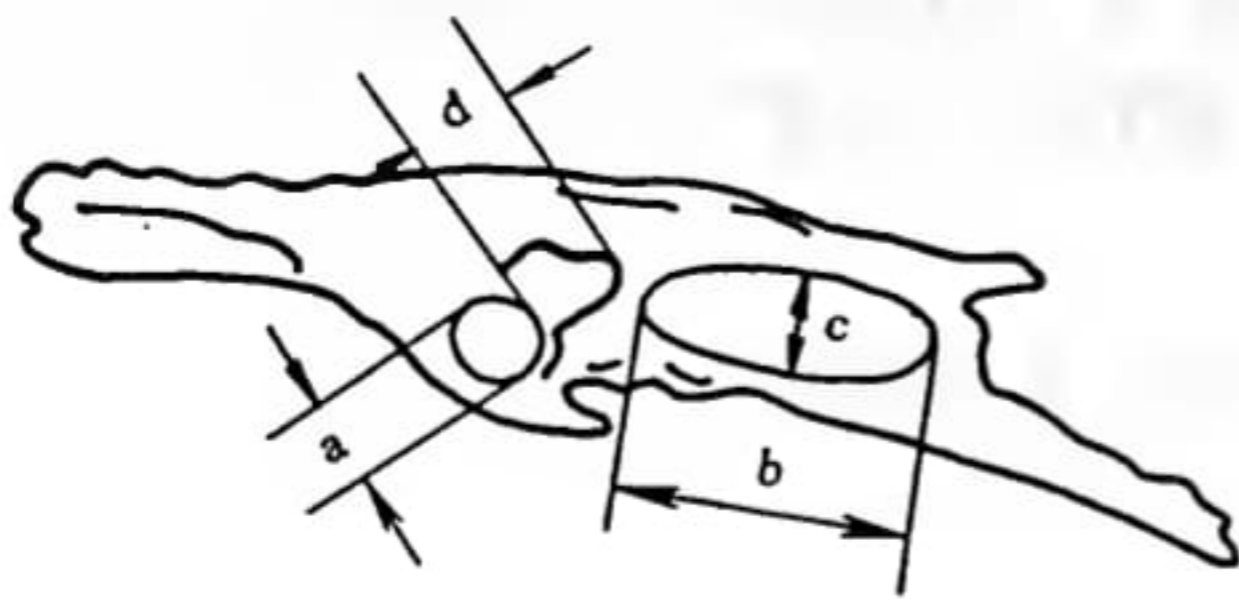


Fig. 1

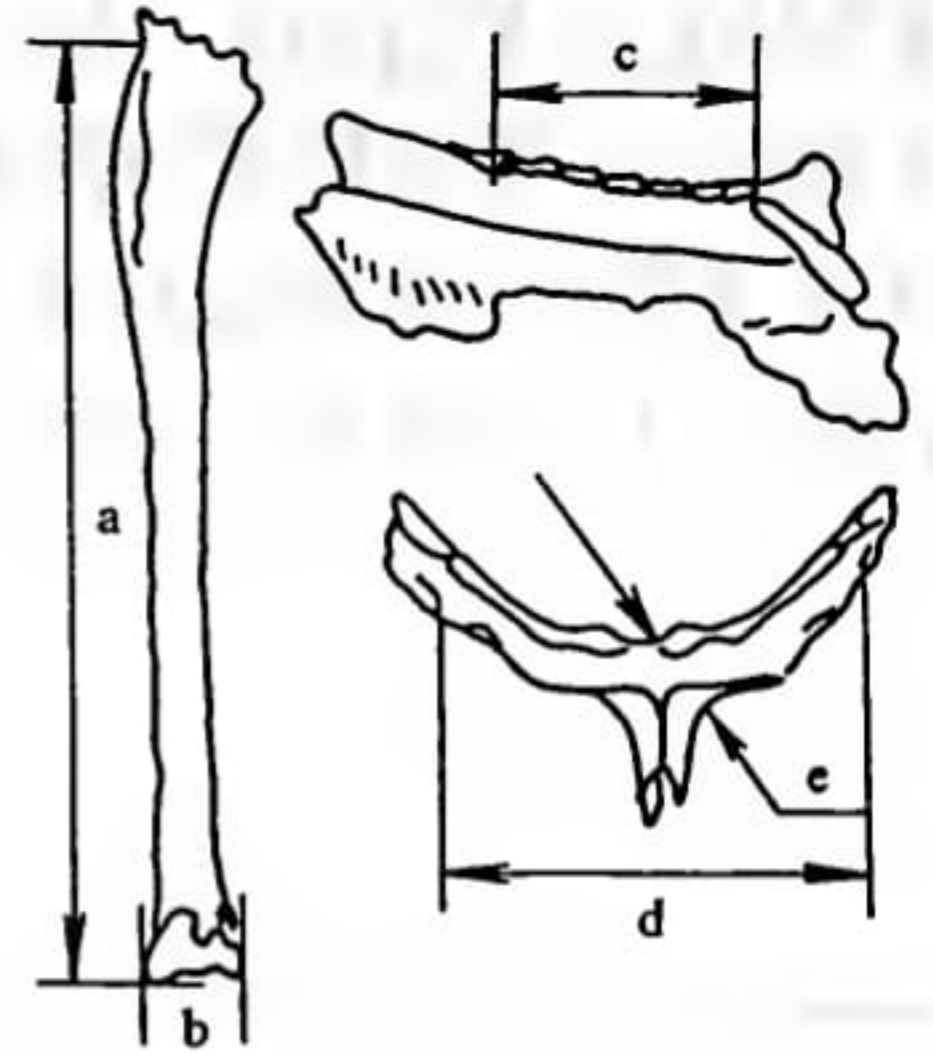


Fig. 2

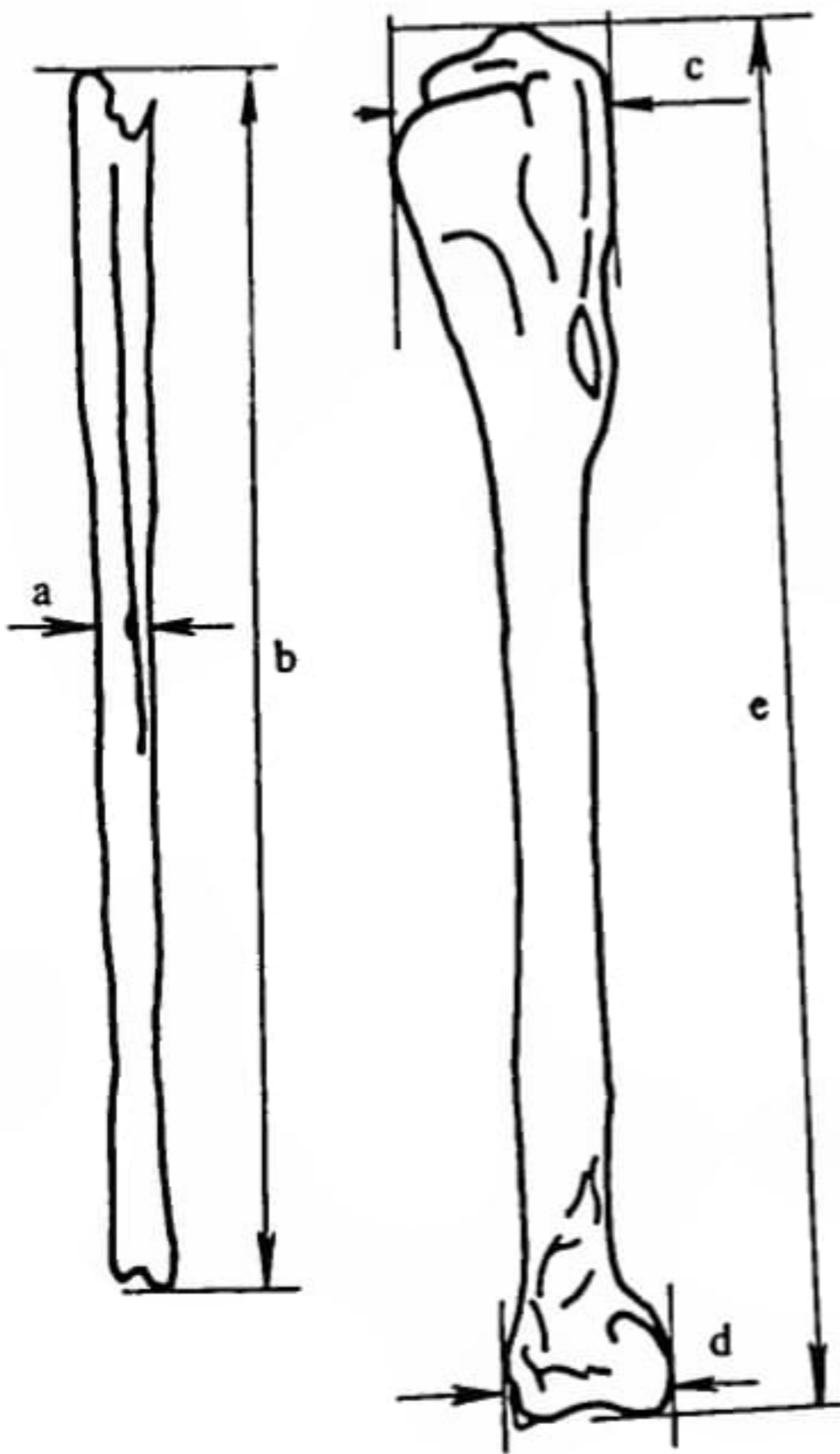


Fig. 3

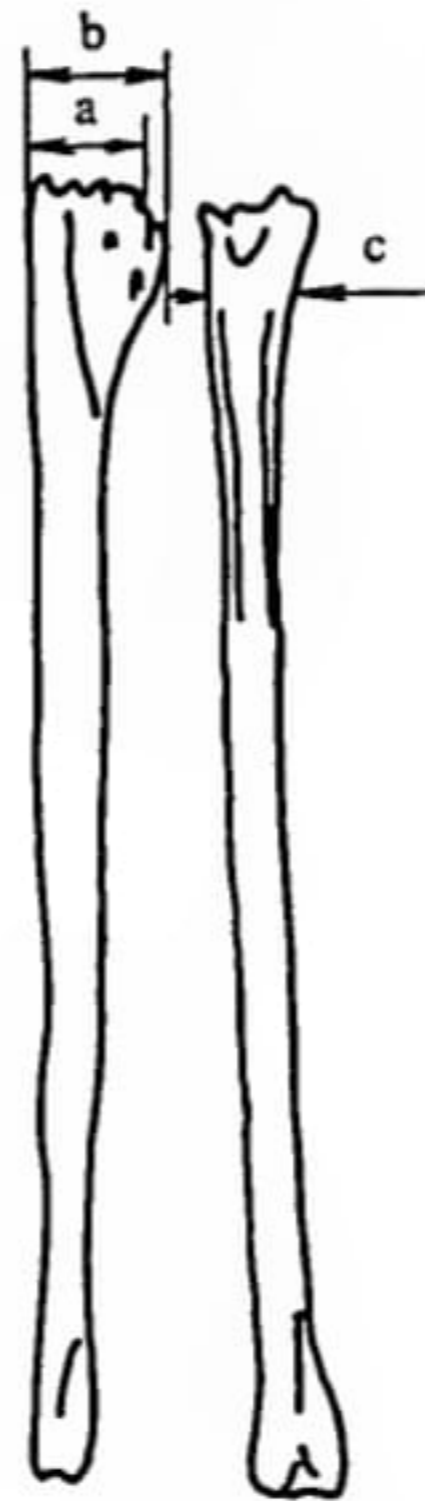


Fig. 4

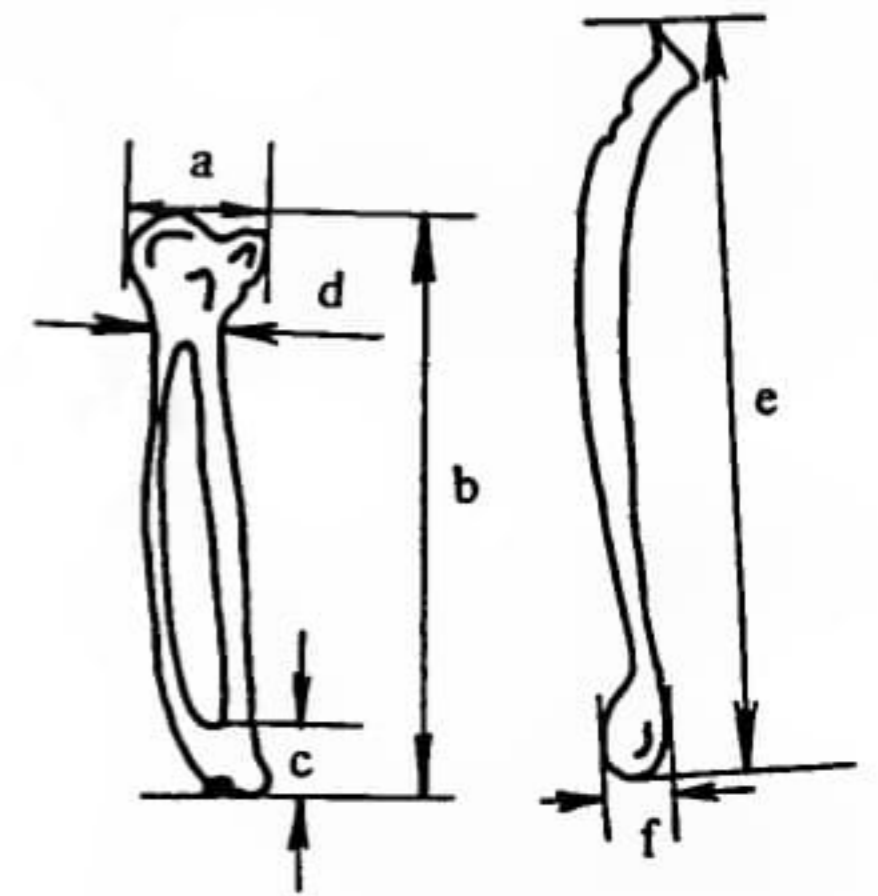


Fig. 5

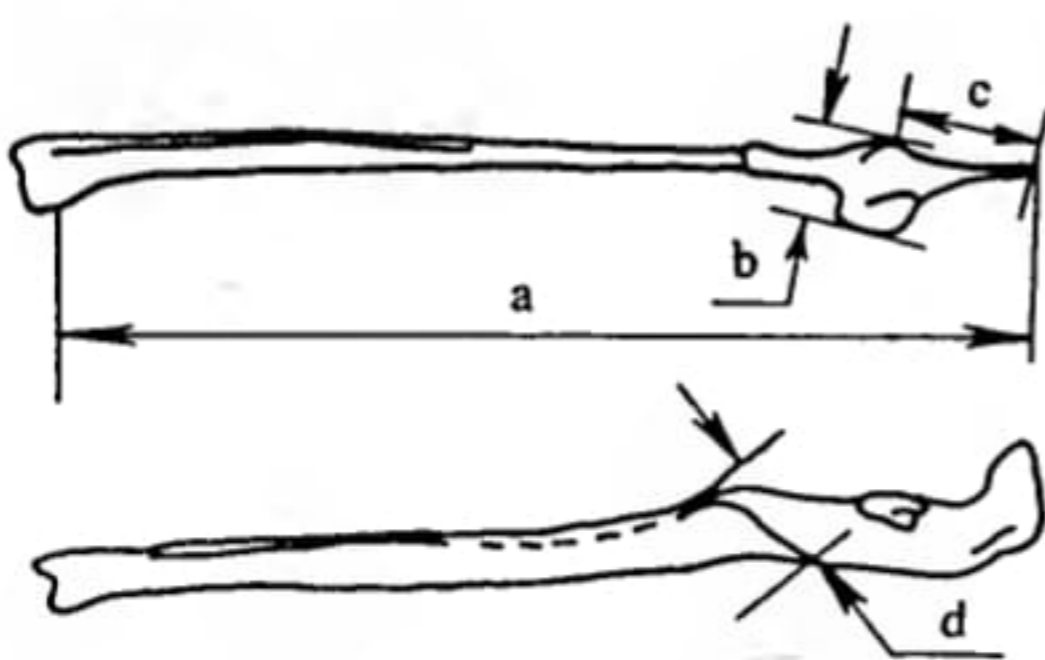


Fig. 6

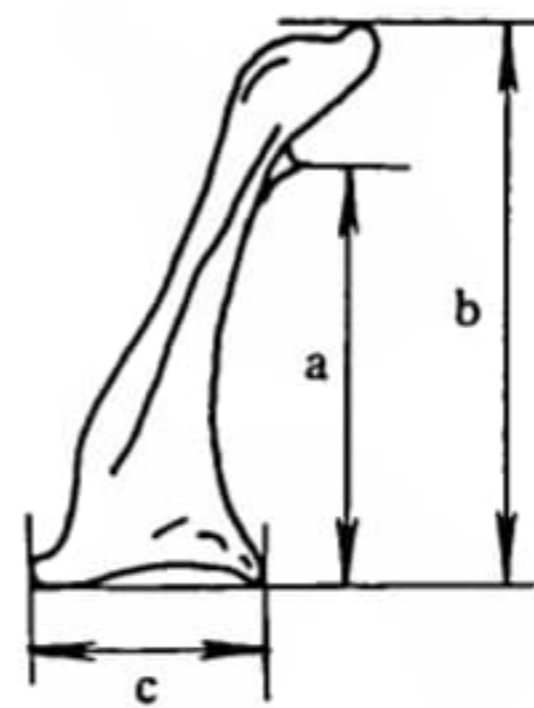


Fig. 7

Fig. 1—7. The manner of measurements of the bones of: *Gavia arctica* (Fig. 1); *Podiceps cristatus* (Fig. 2); *Phalacrocorax carbo* (Fig. 3); *Ardea cinerea* (Fig. 4); *Anas querquedula* (Fig. 5); *Anas platyrhynchos* (Fig. 6); *Aythya nyroca* (Fig. 7)

Table 1

Species distribution of the bird bone material

Species	Number of bone finds	Minimal number of individuals	Abundance of species (%)
<i>Gavia arctica</i>	1	1	1,69
<i>Podiceps cristatus</i>	2	2	3,39
<i>Phalacrocorax carbo</i>	2	2	3,39
<i>Ardea cinerea</i>	1	1	1,69
<i>Anas querquedula</i>	2	2	3,39
<i>Anas platyrhynchos</i>	1	1	1,69
<i>Aythya nyroca</i>	2	2	3,39
Anatinae indet.	58	15	25,42
Accipitridae indet.	1	1	1,69
<i>Gallus/Phasianus</i>	1	1	1,69
<i>Fulica atra</i>	119	31	52,54
Aves indet.	13	—	—

for the country. The average temperature for January is +3,2 C. The summer is dry and the snow blanket is not formed each year (Мишев и др., 1989). These environmental conditions have been favourable for agriculture despite of the comparatively poor soils. Besides the alluvial and delluvial soils, the leached soils have been widespread also (Койнов, 1986). All soils in the region are highly eroded today and their humus reserve is poor. "In general, the soil fund here, is not very favourable for farming." (Мишев и др., 1989, p. 165).

According to Бондев (1982), the region belongs to the so-called "Black Sea district of the Euxinian floristic province", which is typical by its xerotherm (dryliving) oak forests (chiefly *Quercus cerris* L. and *Quercus fraineto* Ten.) and psammophyte (on sandy grounds) and chalophyte (on salt grounds) vegetation. About 6000 years B.P. "the open oak forests" with some thermophylic wood species as *Tilia* sp., *Fraxinus* sp., *Carpinus betulus* L. have been wide represented (Атанасова, 1990). The turkish hazelbush (*Corylus colurna* L.) has been spread wider than today. In some places in the region it has formed the monotypical associations. Following the same author, the optimal temperatures and higher humidity have been specific for the Atlantic period (6000 — 3000 years B.C.). It is proved by the mass pollen of the ivy (*Hedera helix* L.), and especially, between 4700 and 4100 years B.C. This period in the vicinity of the Eneolithic-Early Bronz Age settlement and the whole Bulgarian Black-Sea coast at all, is characteristic by the maximal distribution of the oaks woods with participation of elm, lime, hornbeam, ash, etc. The hornbeam has been spread wider in these woods than today. The xerophyte plant-associations have had more reduced distribution along the coast. Various data indicate that the formation of the recent plant-communities and vegetal zones along the south Black Sea coast in the region has begun between 5000 and 1000 years B.C. (Божилова, 1986). The accelerated modification and devastation of natural vegetation under the influence of the farm activity of man, started about 500 years B.C. The first anthropophyte species has appeared not until Eneolithic, according to pollen analysis of the Arkutino swamp. "The population in this part of Bulgaria has been more sparse, and the agriculture has been comparatively more weakly developed because of the unfavourable relief and soil conditions, and especially — the more difficult forests for utilisation. The archaeological data from the Early Eneolithic of the south Black Sea coast, are scanty. The plateaux have been occupied by more settlements (Божилова, 1986, p. 43).

The geological research of the coast line of the region shows that two terraces (the New-Black Sea terrace — 3,5–5 m, and Nymphaean terrace — 1,2–2 m) have been formed during Holocene. “On the steep sections of the coast (which are typical for the vicinity of Sozopol — Z.B.), the New-Black Sea terrace is very clearly marked in the rear of the well preserved old wave-bored niches and narrow abrasive ground at 4 to 5 metres height.” (П о п о в, М и ш е в, 1974, p. 85). The Nymphaean terrace continues ahead of the gores and is represented by the modern sandy beaches and coast banks in the bays and lagoons. That is comes to show, that the region of Sozopol has been vacated by the sea water and become dryland during the last 10 000 years. The town of Sozopol has been found about 2700 years B.P., while the sunken settlement has been probably built on a coastal landslide, as its going down in the Sozopol bay contradicts to the general process of the regression in this part of the country.

DESCRIPTION OF THE ARCHAEOORNITHOLOGICAL FINDS

Gavia arctica (L.)

M a t e r i a l: C-40 — synsacrum (pars sin.), No 4602.

D e s c r i p t i o n: The strongly elongated shape and the size of the bone indicate unambiguously a Gaviiform bird. The measurements confirm identification as *Gavia arctica* (table 2). The Black-throated Diver is a rare species in Bulgaria. It visits the country's wetlands in winter, most often in the sea lakes and larger rivers. Sometimes it can be observed during the breeding season also (Н а н к и н о в, 1990a), but there is no data on its nesting in the country.

Table 2

The comparisons of the measurements of the synsacrum of subfossil and recent *Gavia arctica*¹

Species	Measurements			
	a	b	c	d
Subfossil:				
<i>Gavia arctica</i> C-40	8,0	23,4	8,8	9,4
Recent:				
1. <i>Gavia arctica</i>	7,5	20,7	8,4	9,3
2. <i>Gavia arctica</i>	7,4	21,9	8,3	10,1
3. <i>Gavia arctica</i>	7,8	20,0	8,4	8,4

¹ The manner of measurings is shown on fig. 1.

Podiceps cristatus (L.)

M a t e r i a l: C-146+C-213 — sternum, No 4506; C-206 — humerus dex., No 4507.

D e s c r i p t i o n: The general shape of these bones is specific for Podicipediformes. All other European species of the order have smaller size, so the measurements of table 3 are sufficient for the species determination. The Great Crested Grebe is a common species of Bulgarian wetlands. It breeds on freshwater lakes and larger pools. A nesting, migratory and wintering species in the country (Н а н к и н о в, 1990b).

Table 3

The comparison of the measurements of the humerus and sternum of subfossil and recent *Podiceps cristatus*¹

Species	Measurements				
	a	b	c	d	e
Subfossil:					
<i>Podiceps cristatus</i> C-206	119,9	9,75	—	—	—
<i>Podiceps cristatus</i> C-146+C-213	—	—	21,8	32,65	4,5
Recent:					
1. <i>Podiceps cristatus</i>	95,8	9,6	21,4	27,3	3,6
2. <i>Podiceps cristatus</i>	93,6	9,8	16,5	29,0	3,8
3. <i>Podiceps griseigena</i>	66,5	7,0	10,0	20,5	2,7

¹ The manner of measurings is given on fig. 2

Phalacrocorax carbo (L.)

Material: C-147 — ulna sin., No 4566; C-40 — humerus sin., No 4567.

Description: The bones structures show a medium sized Pelecaniform bird. The ulnar fragment is 154,3 mm long. The humeral bone is intact. The coincidence of measurements with these of *Phalacrocorax carbo* is evident from table 4. The Cormorant is a threatened species in the recent Bulgarian avifauna. It breeds on the Danube islands only. The total number of the nesting population does not exceed 350 nesting pairs (М и ч е в, 1990; В о е в, 1990).

Table 4

The comparison of the measurements of the humerus and ulna of subfossil and recent *Phalacrocorax carbo*¹

Species	Measurements				
	a	b	c	d	e
Subfossil:					
<i>Phalacrocorax carbo</i> C-417	6,7	154,3	—	—	—
<i>Phalacrocorax carbo</i> C-40	—	—	26,0	17,9	162,0
Recent:					
1. <i>Phalacrocorax carbo</i>	7,0	175,0	26,3	18,9	165,0
2. <i>Phalacrocorax carbo</i>	6,9	157,0	23,2	17,5	149,5
3. <i>Phalacrocorax aristotelis</i>	4,8	130,5	20,4	12,9	123,1

¹ The manner of measurings is given on fig. 3.

Ardea cinerea L.

Material: C-206 — tarsometatarsus sin., No 4559.

Description: Whole tarsometatarsus without endings. The total length of the find is 133,0 mm. The morphological features show family Ardeidae. The tarsometatarsal bones of *Egretta alba* (L.) are much longer, and those of *Ardea purpurea* L. — much shorter. The measurements of table 5 indicate *Ardea cinerea*. The Grey Heron is the most common species of the Herons family in the present day bird fauna of Bulgaria, but its population declines considerably during last few decades because of the poaching around the fishery farms.

Table 5

The comparison of the measurements of the tarsometatarsus of subfossil and recent *Ardea cinerea*¹

Species	Measurements		
	a	b	c
Subfossil:			
<i>Ardea cinerea</i> C-256	8,6	12,9	7,9
Recent:			
1. <i>Ardea cinerea</i>	8,7	14,55	9,3
2. <i>Ardea cinerea</i>	6,6	12,6	7,8
3. <i>Ardea cinerea</i>	8,3	13,5	9,3

¹ The manner of measurings is shown on fig. 4.

Anas querquedula L.

M a t e r i a l: C-51 — carpometacarpus sin., No 4568; C-146+C-213 — ulna dex., No 4565.

D e s c r i p t i o n: The carpometacarpus is completely preserved. The ulna is almost intact with the exception of a small part of the proximal epiphysys. The general shape of the bones show Anatidae family. *Anas querquedula* is one of the smallest Anatid species in Europe, so the measurements of table 6 determine both finds unequivocally.

The Garganey is a common summer visitor for the breeding Bulgarian avifauna. In some cases, however, it remains in the wetlands in the southern parts of the country during the winter. Still a common game in Bulgaria.

Table 6

The comparison of the measurements of the ulna and carpometacarpus of subfossil and recent *Anas querquedula*¹

Species	Measurements					
	a	b	c	d	e	f
Subfossil						
<i>Anas querquedula</i> C-146+C-213	-	-	-	-	55,5	5,8
<i>Anas querquedula</i> C-51	9,4	41,2	6,6	5,0	-	-
Recent:						
1. <i>Anas querquedula</i>	9,2	38,5	6,5	4,6	57,0	6,0
2. <i>Anas querquedula</i>	9,2	38,4	6,4	4,5	56,7	5,9

¹ The manner of measurings is shown on fig. 5.

Anas platyrhynchos (L.)

M a t e r i a l: C-40 — mandibula, pars sin., No 4569.

D e s c r i p t i o n: The left part of the lower jaw is completely preserved. It has features characteristic for the Anatidae species. The peculiarities of the bone shape, especially articular end, and dimensions of bone suggest *Anas platyrhynchos* (table 7). The Mallard is an ordinary waterfowl all over the country wetlands.

Aythya nyroca (G u l d.)

M a t e r i a l: C-41 — coracoid dex., No 4427.; synsacrum, No 4428.

D e s c r i p t i o n: Both finds have features characteristic for Anatidae family. The coracoid is intact. The corpora vertebrorum and left side of synsacrum are also entirely

preserved. The morphological comparison with *Aythya ferina* (L.) shows that both species are very similar, but the structures compared are more elongated in *A. ferina*. The osteological specialities indicate *A. nyroca*. The measurements are given on table 8. The Ferruginous Duck is a threatened species in the recent fauna of Bulgaria. The total nesting population in the country is estimated about 100—150 nesting pairs (Н а н к и - н о в, 1985). Many birds spend winter along the lakes and swamps of the country.

Table 7

The comparison of the measurements of the mandibula of subfossil and recent *Anas platyrhynchos*¹

Species	Measurements			
	a	b	c	d
Subfossil:				
<i>Anas platyrhynchos</i> C-40	82,8	8,4	15,1	5,8
Recent:				
1. <i>Anas platyrhynchos</i>	89,6	8,1	14,0	5,5
2. <i>Anas platyrhynchos</i>	93,0	8,0	14,7	5,6
3. <i>Anas platyrhynchos</i>	93,4	8,8	15,4	5,4

¹ The manner of measurings is shown on fig. 6.

Table 8

The comparison of the measurements of the coracoid and synsacrum of subfossil and recent *Aythya nyroca*

Species	Measurements						
	a	b	c	d	e	f	g
Subfossil:							
<i>Aythya nyroca</i> C-41	35,6	46,3	18,7	—	—	—	—
<i>Aythya nyroca</i> C-41	—	—	—	5,6	5,3	7,4	3,2
Recent:							
1. <i>Aythya nyroca</i>	34,9	45,3	18,3	5,5	5,6	7,8	2,9
2. <i>Aythya nyroca</i>	33,2	42,6	17,3	5,2	5,0	6,6	2,7
3. <i>Aythya ferina</i>	37,3	48,6	19,2	5,4	5,6	8,1	3,2
4. <i>Aythya ferina</i>	37,2	48,2	19,3	5,1	5,7	7,8	3,3

¹ The manner of measurings is shown on fig. 7.

Anatidae indet.

M a t e r i a l: C-34 — humerus sin. without epiphyses, No 4459; tibiotarsus dex., No 4460; tibiotarsus sin., No 4461; ulna dex, No 4462; carpometacarpus dex., No 4463; scapula sin., No 4464; C-206 — humerus dex. without epiphyses, No 4503; sternum, No 4508; 2 humerus sin., No 4509-4510; C-140 — coracoid sin., No 4511; 3 humerus dex., No 4541-4543; humerus sin., No 4544; ulna sin., No 4545; tibiotarsus sin., No 4546; sternum, No 4547; clavícula sin., No 4548; synsacrum, No 4549 radius dex., No 4551; C-146+C-213 — coracoid dex., dist., No 4554; radius dex. dist., No 4560; sternum, No 4561; ulna sin., No 4562; humerus dex. without epiphyses, No 4564; C-40 — coracoid dex., No 4570; 4 humeri without epiphyses, No 4603-4606; clavícula sin., No 4607; 5 humeri dex., No 4608-4612; 4 humeri sin., No 4613-4616; sternum, No 4617; clavícula dex., No 4618; coracoid dex., No 4619; tibiotarsus sin., No 4620; 3 tibiotarsi dex., No 4621-4623; 2 ulnae dex., No 4624-4625; 3 ulnae sin., No 4626-4628; 3 scapulae sin., No 4629-4631; radius dex., No 4632; radius sin., No 4633.

D e s c r i p t i o n: All those bones are characteristic for Anatidae family. Because of the insufficient comparative osteological material of Anatid birds in the Museum col-

lection, they can not be determined further. In spite of that, it is clear, all finds belong to the various species of ducks and diving ducks. The dimensions of the bones suggest 5 to 6 species at least. Two right humeral bones of Anatidae family without marked square number (Nos 38 and 39), have been collected also.

Gallus/Phasianus

M a t e r i a l: C-147 — humerus dex. juv., No 4565.

D e s c r i p t i o n: The diaphysis without both epiphyses is preserved. The shape of the find suggests a Phasianid bird, but its dimensions (total length — 52,5 mm; minimal width of diaphysis — 7,0 mm) indicate a bird larger than *Perdix* and *Alectoris* species. There is no reliable data in Bulgaria so far for the presence of the domestic fowl (*Gallus gallus domestica*) during Bronze Age. The earliest known finds of the species are dated 7th century B.C. (Б о е в, 1991). It seems that the pheasant is the most probable for the find. More exact determination of the bone is not possible.

Accipitridae indet.

M a t e r i a l: C-34 — radius dex., No 4458.

D e s c r i p t i o n: Both epiphyses are missing. The proximal ending of bone is cut and filed down. The total length of the find is 154 mm. The maximal width of the diaphysis at the level of the foramen nutritium is 6,6 mm. The general shape of the bone and the shape of for. nutritium indicate a medium sized Accipitrid bird.

CONCLUSIONS

The inhabitants of the Eneolithic and Early Bronze Age settlement at the Sozopol Bay have used the abundant birdlife in the near surroundings. Usually they have used the larger and the most common of bird species as a source of meat for food. The Coot is the most numerous among the hunted wild birds. Its share is about 52,5 per cent of the total number of the killed individuals of birds by men. All species except one (an undetermined Falconiform bird) are gamefowl. The body mass of the hunted birds varies between 0,5 and 3,0 kilogrammes. The preferred habitats of established species suppose that large swamps and lakes, which shores have been overgrown with reed, can, and other hydrophylic vegetation, have been spread in the vicinity of settlement.

Table 9

Comparison of subfossil bird fauna of Sozopol with the Early Bronze Age (Urdoviza) and recent avifauna of the region

Species	Sozopol	Urdoviza ¹	Strandzha mountain ²
<i>Gavia arctica</i>	+	+	+
<i>Podiceps cristatus</i>	+	+	+
<i>Phalacrocorax carbo</i>	+	+	+
<i>Ardea cinerea</i>	+	-	+
<i>Anas querquedula</i>	+	-	+
<i>Anas platyrhynchos</i>	+	+	+
<i>Aythya nyroca</i>	+	+	+
<i>Fulica atra</i>	+	+	+

¹ According to Б о е в, Р и б а р о в (1990); the total number of species is 25.

² According to М и л ч е в (1991); the total number of species is 273.

Some species as the Black-throated diver, the Great crested grebe, and partly, the Coot and the Cormorant, are entirely aquatic birds. They spend their life in the water and go out on the dry land very seldom. Probably, in order to catch them, the ancient hunters of the region have used some traps, loops, nets, clapnets, etc. In all these cases they have used small boats to reach the caught birds in the water

A c k n o w l e d g e m e n t

The author extends his gratitude to Dr Georgi Ribarov (District Museum of History — Jambol) for offering the material studied.

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Received on 9.X.1991

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ПТИЦИ ОТ ЕНЕОЛИТНАТА И РАННОБРОНЗОВАТА ЕПОХА ОТ ПОТЪНАЛОТО СЕЛИЩЕ В СОЗОПОЛСКИЯ ЗАЛИВ (БЪЛГАРСКО ЧЕРНОМОРИЕ)

ЗЛАТОЗАР БОЕВ

(Резюме)

Изследвани са костните останки от птици, извлечени при многогодишните подводни разкопки в Созополския залив на Черно море. Материалът е датиран 5000—4000 г. пр. н.е. и възлиза на 203 бр. кости и костни фрагменти, от които само 13 са неопределяеми. Установено е значително разнообразие на водолюбиви крайбрежни и блатни птици, сред които преобладава водоплаващият дивеч (42,3 %). Определени са 8 вида птици: *Gavia arctica*, *Podiceps cristatus*, *Phalacrocorax carbo*, *Ardea cinerea*, *Anas querquedula*, *Anas platyrhynchos*, *Aythya nyroca* и *Fulica atra*, както и *Anatinae indet.*, *Accipitridae indet.* и *Gallus/Phasianus*. Най-многочислен вид е лиската, представена със 119 кости (52,5 % от изследвания материал). Всички установени видове са били обект на лов от жителите на селището. Повечето от тях и днес са ценни ловни обекти и теглото им варира от 0,5 до 3,0 kg. Предпочитаните от тези птици местообитания са свидетелство, че през енеолита и раннобронзовата епоха в околността на селището е имало обширни заливни участъци с блата и езера, чиито брегове са били обрасли с тръстика, папур и друга блатна растителност.

По някои от костите личат следи от обработка — разрязване, запилване и пр., което показва, че птиците са имали и вторична употреба. Някои видове, като черногушия гмуркач, големия гмурец, отчасти лиската и големия корморан, са почти изцяло водни обитатели и много рядко излизат на сушата (главно при гнездене). За да бъдат уловени, очевидно се е налагало да се използват мрежи, примки или стрели. Във всички тези случаи ловът е ставал най-често във водата с използването на малки лодки. Единствената птица, която не е ловен обект (неопределена до вид ястребова птица), е установена по една обработена лъчева кост. Това потвърждава, че птичите костни останки са били отложени в резултат на ловностопанската дейност на населението от потъналото селище.