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Reviewed Article:

Acutus' Eagle Bone and Two Bone Tubes with Holes Found in A Roman Fleet Base in The Netherlands - About Signalling Whistles and Animal Calls

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At the location of a former Roman military fort and fleet base existing from AD 15-28 in Velsen, The Netherlands, more than 3000 bones and bone fragments were excavated. Three of these can be interpreted as musical instruments. Two bone tubes, of a roe deer and a

stork, are provided with one and three holes respectively, on the third, a length of an eagle wing bone with one joint removed and the other left on, is scribed a name. This article investigates the possibility that these were made as wind instruments: as reed instruments and as rim-blown vessel flutes. Their sound-producing qualities and the context suggest they once were used as animal calls.

> The Velsen wind instruments (and the Valkenburg whistles) are rare witnesses of the use of animal calls in the Roman period in the Netherlands and of other than military activities of Roman soldiers.

Introduction: Velsen, once a Roman fleet base in the north of Netherlands, 15-28 AD

In 15 AD, a unit of Roman soldiers from the German Rhineland arrived in the present Dutch province of North Holland. They built a military naval harbour and castellum, on the bank of the North Sea estuary in the West of the Netherlands, at the location of present-day Velsen. Initially, some 450 soldiers of Spanish, French, and Italian origin were stationed here; later on, the number more than doubled (Morel and Groenman-van Waateringe, 1993; Lendering and Bosman, 2012, p.74). For the next thirteen years, the Romans occupied the fort and traded with the indigenous Frisian population. In 28 AD, however, a tax conflict with the Roman governor led to a Frisian attack on the Velsen castellum. After three subsequent attacks and a fierce battle (as witnessed by more than 520 lead sling bullets of the Romans that were excavated (Lendering and Bosman, 2012, p.74; Bosman, 2016, pp.46-48), the Romans had to abandon the fort in such a hurry they did not spend time burying their dead. In the end, the Romans gave up their efforts to occupy the regions north of the Rhine and the Velsen fort location was never used again. Frisian peasants living in the environments may possibly have pillaged the remaining buildings and tents and took with them whatever they had a use for (Vons and Bosman, 1988, pp.3,8). Anything left above ground will have been washed away by flooding in later ages, but many objects, human bones and thousands of animal bones were preserved in the wet soil. Only when prior to construction works for a traffic tunnel, archaeological investigations were executed, it became clear a Roman fort once was located here. Subsequently, extensive excavations took place (Vons and Bosman, 1988; Morel and Groenman-van Waateringe, 1993; Bosman, 1997; Lendering and Bosman, 2012; Bosman, 2016). Among the countless objects found in the soil, e.g. 138.000 fragments of Roman ceramic, 1.400 wooden tent pegs (Driessen, 2014, p.214) and 3.399 bird bones (Prummel, 1987, p.184) were three small worked animal bones that are interpreted as wind instruments here (See Figure 1).

The bone wind instruments found at the site of the Velsen fleet base

Several different types of Roman musical instruments have been excavated in Roman forts and settlements in the Netherlands,, both in military as well as in civilian contexts. These are the kind of instruments known from a Roman context in other countries too; e.g. countless

cast bronze horse harness and bathhouse bells, several parts of military brass wind instruments, a number of bronze cymbals once attached to wooden stick handles, ceramic rattles, wooden panpipes, a bone double shawm, small bone duct flutes (De Bruin, 2020, p.50; Tamboer, 1999, figs.13,27,39,60, 91,92). Nothing of this kind was excavated in Velsen. Three small bone tubes interpreted here as wind instruments are all that remain of the soundscape from this naval base.

Of the more than 3000 bones excavated in Roman Velsen, the three bone wind instruments are the only obvious candidates to be interpreted as sound instruments. One of these is made out of a roe deer leg bone (metatarsus of Capreolus capreolus); two others are fashioned from bird bones: a white-tailed sea-eagle wing bone (ulna, proximal, of Haliaeetus albicilla) and a stork wing bone (ulna of Ciconia alba). The soldiers stationed in Velsen were of Spanish, French, and Italian origin. They could have taken these small instruments with them on their journey to the Netherlands. They could also have made them when having arrived, as the bones used came from animals indigenous to the Netherlands. The soldiers appear to have supplemented their army diet with these animals hunted as a leisure activity in the wetland environment of the fort, as witnessed by bones of roe deer and of 36 species of wild birds that were fowled (Prummel, 1987). It is conceivable that some bones leftover from the consumption of these birds were turned into wind instruments on location. Their size and limited sound-producing possibilities suggest they were used as signalling instruments, animal calls or lures used to attract the animals to be caught. Bird whistles and animal calls as well as other fowling techniques and materials, like decoy birds, bird lime, nets, snares and traps, are mentioned in Roman written sources (Prummel, 1987), but no descriptions that could inform us about their construction and use are known. Hence the small instruments of Velsen fill in a gap in the knowledge of those simple Roman instruments that were played to sound signals or imitate animals rather than melodies.

Acutus' eagle bone, a rim-blown whistle

Several bones of the white-tailed eagle (Haliaeetus albicilla) have been found in Velsen. This bird of prey will not have been hunted for its meat but for its wing and tail feathers that were used for the fletching of arrows (Prummel 1987, p.195). One of these bones is the wing bone, a proximal ulna, shown in Figures 2, 3 and 4, measuring 11,8 x 2,2 x 1,6 cm. On a flat side near the joint is scribed "ACVTVS", Acutus, a Roman man's name, as we know from potter's inscriptions on pottery from France (Bosman, 1997, pp.50,82), is an indisputable indication this is not an object lost in the Velsen fort by a Frisian. The careful finish of the cut end and the inscription make clear it was not butchered for a meal, the more as eagles were not eaten, but that this was an object valued by its owner. Bone tubes are known to have been used for purposes like needle cases and knife handles. The shape, size, and the fact that the irregular shape of the joint is left on makes it improbable this eagle bone was used as a needle case or a handle and no traces of use-wear point to these functions. When considered

a musical instrument, the joint closing off the tube determines its type as a stopped single end-blown flute (Hornbostel and Sachs, 1961). This type of flute is known from cultures around the world, being put to different uses: as a signalling whistle, as an animal call or as a musical instrument. The rim is cut off very neatly; hence it is able to produce a surprisingly loud whistling sound when blown across. It is tempting to interpret “acutus” as the adjective “high” or “sharp”, as a designation of a quality of its sound, but it is more probable “acutus” was the name of the maker and owner of the whistle. Being found in a naval fleet base, interpretation as a boatswain whistle used to sound signals aboard seems evident. A boatswain whistle must be easy to sound and when both hands are needed aboard, it must be blown held between the lips. As Acutus’ whistle is blown across the rim and has to be held by the hand, adjusting the angle to the lips, use as a boatswain call seems improbable. The construction of this kind of stopped whistle is simple, but nevertheless, proficient players can produce different sounds and volumes, signals, as well as animal sounds. As we know from the bird bones excavated in Velsen, wild birds were fowled around this naval base. It is not improbable Acutus’s whistle was a call, maybe used in order to lure birds into nets or snares, or near enough to the fowler to be shot.

A stork wing bone with three holes drilled in a row, interpreted as a reed call

A second instrument find from Roman Velsen (See Figure 5) is a worked tubular bone from the wing of a stork with a diameter that ranges between 8,3 and 9 mm (Bosman, 1997, p.45). It had its joints removed, was cut down to 8,6 cm in length and was scraped with a knife to remove the bulges where the feathers were attached. The ends were not sawn off but cut with a knife. No care was taken to finish it off in a straight transverse cut, nor was it rounded off or made oblique to facilitate blowing on the rim in order to produce sound. The sharp, straight edges of the holes make clear these were made by using a drill, not by scraping with a knife as seen in most bone duct flutes excavated in the Netherlands (for a contemporary Frisian example: Tamboer, 1999, fig. 5). Each hole in the stork wing bone has a different size: 3,2 mm, 3,9 mm, and 2,9 mm. They are placed not quite in a straight line but in irregular distances of 9,5 mm. and 20 mm. Related bird bones with holes that are interpreted as wind instruments are reed instruments excavated in Mook and Hatsum, The Netherlands (Rimmer, 1975; Tamboer, 1999, fig.59,60). The first is a double-reed pipe made from two large wing bones (ulnae) of an eagle, and the second is a single swan bone; both have six finger holes but lack a window as present in duct flutes. Reeds, whether from vegetable or animal material, decay easily and are rarely found. Was the Velsen ulna originally perhaps provided with a reed too? The irregularly shaped rims are a disadvantage for a flute meant to be rim-blown but do not matter for a reed instrument. An experimental reconstruction was made to test this hypothesis. Because of small the size and diameter of this stork ulna, a single reed was chosen. Single reeds can be cut in different materials, like a reed, elder twigs, or feather shafts. A large swan feather quill appeared to fit in perfectly, as this material is flexible, adapting itself to the slightly irregular bore of the stork bone. It is very easy to make by just

cutting a vibrating lip in the shaft (See Figure 6). This material was at hand in the Velsen environment as birds were abundant. Roman written sources do not go into detail concerning the material and make of these reeds. The earliest written source that may be referring to reeds made of a feather is the music treatise *Musica getutscht* of Sebastian Virdung (Basle, 1511). In the category of "foolish instruments" (i.e. not suited to play art music), he mentions "...little whistles, [made] from quill feathers; the fowler's bird calls, [like] quail calls, lark whistles, titmouse calls ... "(transl. Bullard, 1993, p.119).

When playing the reconstruction with the swan reed depicted in Figure 6, only the hole near the reed proved to change the sound to a substantially different note. The reed itself, played without the bone pipe attached, can produce g - f# (4th octave), depending on breath pressure. Mounted in the bone pipe, it sounds about c with the top hole closed, about d# when open. The other holes merely changed the tone color. Differently cut swan reed will produce different sounds but not enlarge the ambitus. This reed instrument evidently was not intended for playing melodies.

A variety of reed-driven animal calls are used for luring deer, all kinds of waterfowl (See Figure 7) and fox (See Figure 8). The sound of the Velsen reconstruction reminds us of roe deer calls. Hunters, in the past as well as nowadays, use a reed instrument to imitate the plaintive call of a young kit to lure roe deer into a shooting (or photographing) distance. Changes in tone color can assist in imitating the sound of the animal as closely as possible. Modern reed calls usually have a wind cap in order to protect the reed. No traces were left by an eventual wind cap as shown in the modern calls of Figures 7-8 are present on the Velsen find. Probably it did not have one, as it would not fit airtight on the flaring shape of the bone. The fact the reed was more vulnerable without a cap may not have been a large problem, as a new reed to replace the damaged one is easily cut in a length of feather shaft.

A roe deer metatarsal interpreted as a reed animal call

In Velsen, a roe deer metatarsal carefully made into a rectangular tube with a hole was found (Bosman, 1997, p.50) (See Figures 9 and 10). The joints from both ends were removed, the bone was scraped into a more quadratic shape than it was originally, and a hole was made in the thick wall of the bone, using a drill, as witnessed by the perpendicular sharp edges. The hole, with a diameter of 5 mm, was put more or less in the middle of one side: 4,5 cm. from one end, 4,1 cm. from the other end. Bone tubes with holes in the middle could be used as buttons, but these are not as long in proportion to the diameter. Another type of tube with a hole was a needle case with a metal suspension chain fastened in the hole. This would have caused abrasions of the sides of the hole which were not found in the Velsen bone. The tube is too short to be played as a transverse flute, moreover, the hole to be used as a mouthpiece has a rim that is very thick in relation to its diameter, and proved to produce at most a hissing sound. In some types of signalling whistles or animal calls, however, the window hole is placed in the middle. This kind of whistle goes back to the late Neolithic, e.g., one of the

whistles excavated in Hemudu (China) that is interpreted as a deer call. This type of calls is still being used, like a type of otter pipe known from Norway (Lund, 1988, pp.299-302). Examples from the Roman period in the Netherlands are several signalling whistles found in Valkenburg (Tamboer, 1999, fig. 13). One of these was made from a wing bone (humerus) of a crane (Grus), length 7,6 cm., diameter 1,7 cm. (See Figure 11).

The window is cut into the stirrup shape common in excavated bone block-and-duct flutes and calls (Brade, 1975; Tamboer, 2004, fig.1-5). In order to sound the Valkenburg whistle, a small lump of wax must be placed beneath the window in order to deflect the air to the lip of the window. A narrow and long version is a modern metal hazel hen call (See Figure 12). This type of whistle was and is still used as a multi-purpose animal call for hazel hen, roe deer, as well as fox and other animals that catch birds: in this case, not the animal itself one wants to catch is imitated but its prey animal, the sound of which will lure the hunted animal (e.g., documented for Slovakia in Elschek, 1983, pp.125-126).

The Velsen roe deer metatarsal is about as slender as the metal hazel hen call of Figure 12. The window of the hazel hen call has a half-moon-shaped window with a lower rim that is oblique. This splits the air stream and produces the sound. Some types of calls do function even when the rim of the window is not thinned out, like the quail call of Figure 13 that is bellows-driven. By tapping the leather pouch filled with horsehair, a whisp of air produces rather soft plosive sounds resembling those of quails. However, the bone is considerably thinner than in the Velsen deer bone, and a lump of wax is inserted to deflect the air to the window rim and produce sound.

A pouch bellow was added to a replica of the Velsen bone tube, but this did not generate enough air pressure to sound it. The rim of the window proved to be too thick. The hole probably was not intended as a sounding window but as a finger hole. Blowing on the thick rim of either end, like in rim-blown flutes, did produce a rather soft hissing sound when the hole halfway the tube was left open, probably due to the fact that the distance between the rim and the hole was too short. When played with the hole closed off the bone tube produced a whistling sound. However, this hole would not have been made without any purpose.The solution proved to be the use of a reed as a sound generator. The same feather reed as used in the reconstruction of the Velsen stork ulna proved to fit in well. The hole now functioned as a finger hole that could influence the sound being played by the reed.

Inserting the same feather reed sounding g-$f^{\#}$ as used in the Velsen stork ulna with three holes, the roe deer metatarsal sounds d^4 with finger hole open and c^4 with finger hole closed (See Figure 14). The reedy sound resembles that of several waterfowl species. By blowing weaker or more forcefully, by totally or partly closing up the hole, by closing up or opening up the end and combinations of these, an experienced player probably can imitate different calls

and hereby can lure birds into the bird catcher's nets or into shooting distance, or lure a fox by deceiving it with bird's sounds.

Conclusion

Compared to the range of instrument finds of Roman provenance mentioned before, the instruments from the Frisians that can be dated to this period are sparse: a duct flute with three finger holes from Kimswerd (Tamboer, 1999, fig. 5) and a number of pottery rattles (Tamboer, 1999, fig. 76), but no whistles comparable to the finds of Velsen. As the soldiers stationed in Velsen originated from Italy, Gaul and Spain, it is an obvious conclusion the excavated bone wind instruments were known in one or more of the soldiers' countries of provenance, but more research is due here. Nevertheless, the Velsen wind instruments (and the Valkenburg whistles) are rare witnesses of the use of animal calls in the Roman period in the Netherlands and of other than military activities of Roman soldiers.

Keywords music & musical instruments

Country the Netherlands

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FIG 1. REPLICAS OF THE WORKED ANIMAL BONES OF VELSEN THAT ARE INTERPRETED AS WIND INSTRUMENTS. LENGTHS FROM TOP TO BOTTOM: 11,6 CM., 9,2 CM., 8.6 CM. PHOTO BY ANNEMIES TAMBOER

FIG 2. WORKED WHITE-TAILED SEA-EAGLE WING BONE (ULNA, PROXIMAL, HALIAEETUS ALBICILLA). LENGTH 11,8 CM. COLLECTION AND PHOTOGRAPH RIJKSMUSEUM VAN OUDHEDEN, LEIDEN (THE NETHERLANDS).

FIG 3. WHITE-TAILED SEA-EAGLE WING BONE. THE CUT END IS FINISHED CAREFULLY. COLLECTION AND PHOTOGRAPH RIJKSMUSEUM VAN OUDHEDEN, LEIDEN (THE NETHERLANDS).

FIG 4. “ACVTVS” IN ROMAN SCRIPT, SCRIBED IN THE BONE SURFACE WITH A SHARP METAL POINT, POSSIBLY THE PIN OF A BROOCH. COLLECTION AND PHOTOGRAPH RIJKSMUSEUM VAN OUDHEDEN, LEIDEN (THE, NETHERLANDS).

FIG 5. WORKED STORK WING BONE (ULNA OF CICONIA ALBA) EXCAVATED IN VELSEN. LENGTH 8,6 CM. COLLECTION AND PHOTOGRAPH, RIJKSMUSEUM VAN OUDHEDEN, LEIDEN (THE NETHERLANDS).

FIG 6. RECONSTRUCTION OF THE VELSEN CALL MADE FROM A GOOSE ULNA THE SAME SIZE AS THE FIND FROM VELSEN AND A SWAN FEATHER SHAFT AS A REED. PHOTO BY ANNEMIES TAMBOER

FIG 7. HORN DUCK CALL WITH A LARGE BRASS REED, SHOWN WITHOUT ITS CAP. LENGTH 16,7 CM. NUREMBERG? (GERMANY), 18TH CENTURY. COLLECTION BAYRISCHES NATIONALMUSEUM, MÜNCHEN.

FIG 8. REED FOX CALL WITH WIND CAP, BRAND: WEISSKIRCHEN (GERMANY), ACQUIRED IN 2014. BEECHWOOD, SYNTHETIC MATERIAL, SHEET METAL REED. PHOTO BY ANNEMIES TAMBOER

FIG 9. FRONT AND BACK OF A WORKED ROE DEER (CAPREOLUS CAPREOLUS) METATARSAL EXCAVATED IN VELSEN. 9,2 X 1 X 0,8 CM. COLLECTION AND PHOTOGRAPHS: RIJKSMUSEUM VAN OUDHEDEN, LEIDEN (THE NETHERLANDS).

FIG 10. BACK OF A WORKED ROE DEER (CAPREOLUS CAPREOLUS) METATARSAL EXCAVATED IN VELSEN. 9,2 X 1 X 0,8 CM. COLLECTION AND PHOTOGRAPHS: RIJKSMUSEUM VAN OUDHEDEN, LEIDEN (THE NETHERLANDS).

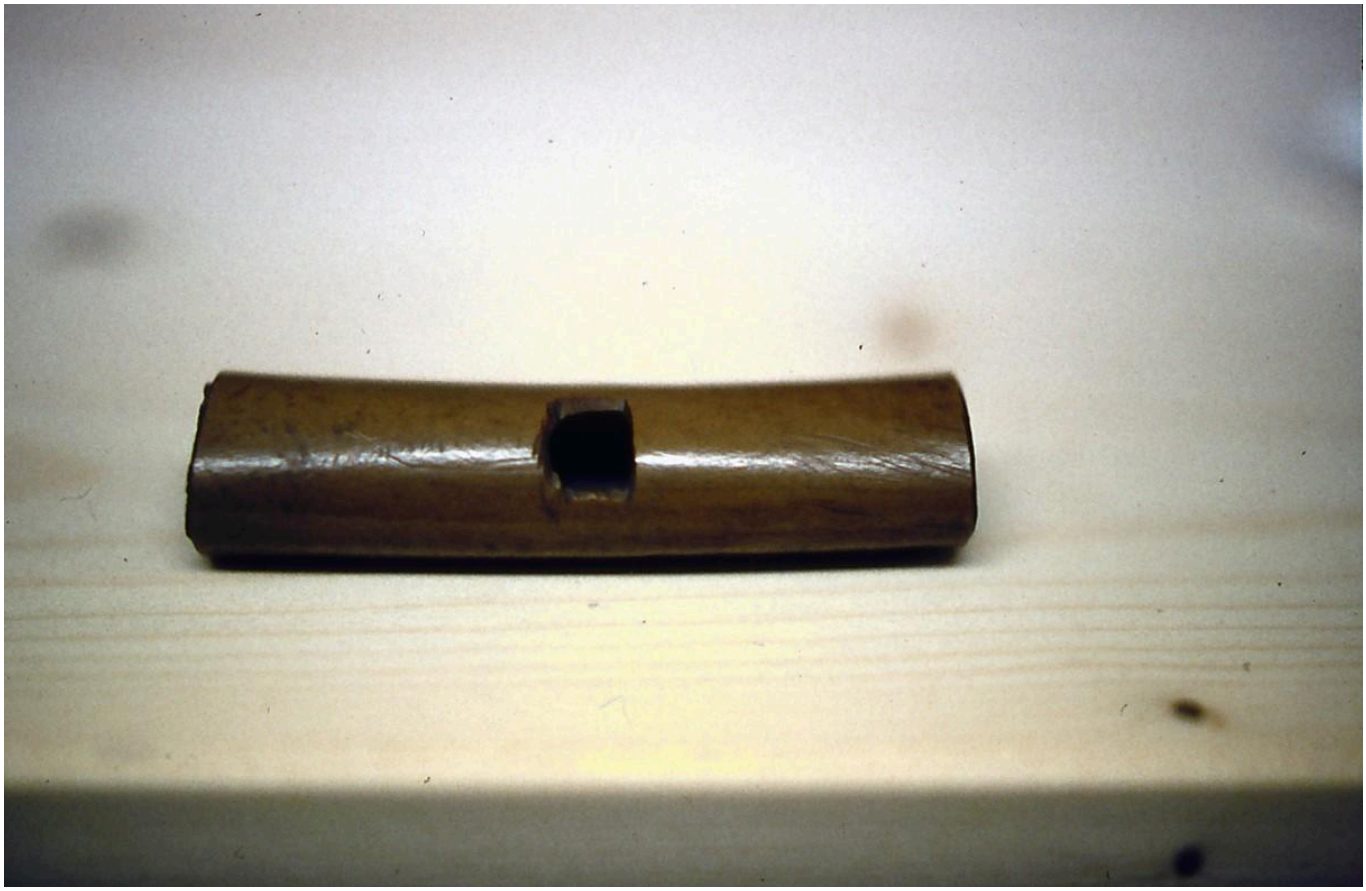

FIG 11. ROMAN CASTELLUM OF VALKENBURG (THE NETHERLANDS), A SIGNALLING WHISTLE MADE FROM A WING BONE (HUMERUS) OF A CRANE (GRUS). LENGTH 7,6 CM., DIAMETER 1,7 CM. PHOTO BY ANNEMIES TAMBOER

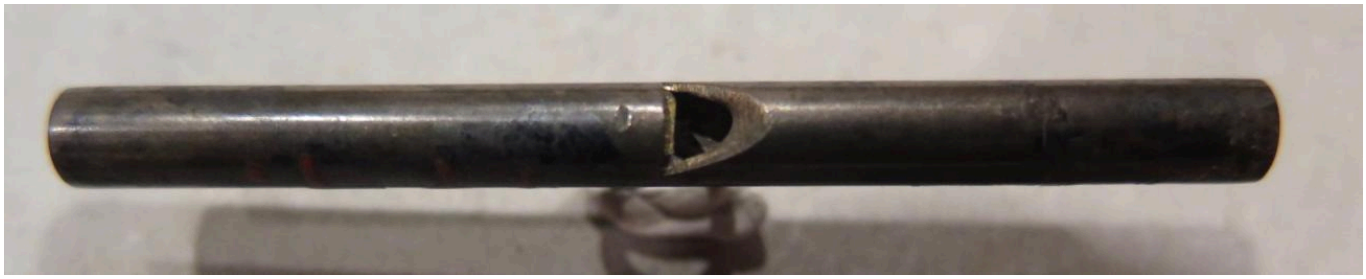

FIG 12. GUNMETAL HAZEL HEN CALL, THE FIRST HALF OF 20TH CENTURY. LENGTH 5 CM. COLLECTION SUOMEN METSÄSTYSMUSEO, RIIHIMÄKI (FINLAND).

FIG 13. 20TH-CENTURY QUAIL CALL WITH LEATHER POUCH BELLOW. LENGTH OF BONE WHISTLE 4 CM., TOTAL LENGTH 10 CM. COLLECTION NEDERLANDS JACHTMUSEUM, DOORWERTH CASTLE, DOORWERTH (THE

NETHERLANDS).

FIG 14. RECONSTRUCTION OF THE VELSEN ROE DEER METATARSAL AS A REED INSTRUMENT. PHOTO BY ANNEMIES TAMBOER