

# FOSSIL IVORY INFORMATION

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### Types of Fossil Ivory

#### Walrus Ivory

Old Walrus Ivory is derived from two sources. The majority is excavated from ancient Eskimo dwellings or village sites and is 100 to 2500 years old. The color of the ivory is dependant on how long it has been buried and the type of soil it's buried in. Black ivory comes from brownish-black organic soil while the brownish or orangish colored material is excavated from iron stained sandy or gravelly soils.

A lesser amount of old walrus ivory is collected along the beach after storms or by use of a grappling hook and is commonly called beach ivory. Some of the beach ivory is derived from ancient Eskimo dwellings, which are now under the ocean, and the remainder comes from walruses, which have died from natural causes, usually stampedes. Walruses have hauling-out places where they rest during migrations or near their summer feeding grounds. Occasionally, some disturbance will cause the whole herd to stampede toward the water and a few to a hundred or more animals may be crushed and killed in the stampede. Beach ivory can be very recent or much older than dug ivory and the color will vary from off white to dark brown, black or bluish black. Mineralized out of bottom of the ocean in salt water this material is often more fossilized and usually more stable to work with than dug walrus ivory.

A walrus tusk cut in cross sections will reveal two distinctive types of material: the outer enamel which is harder and uniform in texture and the inner, softer, dentine or core, which has a crystalline appearance. The enamel layer is usually 3/8" to 1/2" thick in both male and female walrus ivory, but the core of female ivory is small compared to the core of male ivory. Adult female walrus tusks usually weigh 1 1/2 to 2 lbs while adult male tusks usually weigh 4 to 6 lbs and can be 10 lbs or more on rare occasions.

Walruses use their tusks to dig clams from the ocean bottom, to assist in hauling out on ice flows, for sparing and for defense. This results in stress cracks in the enamel layer of the ivory commonly noted as the black lines on white ivory. Male ivory usually has more stress cracks than female ivory. Most Eskimo ivory carvers use female ivory or young ivory with minimal stress cracking for their art.

### **Mammoth and Mastodont Ivory**

Although commonly called Mastadon Ivory, at least 98% of the ancient elephant ivory from Alaska, Siberia or N. Western Canada is Mammoth Ivory. The Mastadon line has gone extinct while the Mammoth line survives today as the Asian and African elephant. Mammoth ivory from Alaska is from 11,000 to 40,000 years old. Bones and ivory radiocarbon dated from interior Alaska near Fairbanks is commonly 25-28,000 years old. Preserved frozen for thousands of years, the material is still usable while most Mammoth and Mastadon ivory from lower latitudes in the Continental U.S. has been mineralized into stone.

Mammoth Ivory has an outer enamel layer commonly called bark ivory which is harder than the inner ivory or dentine. Commonly, the inner dentine will be completely rotted away while the bark is still usable for artwork. Mastadon Tusks do not have a bark ivory layer distinct from the ivory in the inside of the tusk.

The quality of Mammoth Ivory varies considerable from rotted material previously mentioned to very solid tusks, which can be sawed into dimensional materials. Calling rotted material D-grade and sawable solid material A-grade, Alaskan Mammoth Ivory is approximately 15% D-grade, 15% C-grade, 60% B-grade and 10% A-grade. B-grade material is the most common and has longitudinal cracks in the bark and the ring cracks internally. The B-grade inner ivory is usable.

Female Mammoths had small tusks, usually 4 to 6 feet long and 15 to 45 lbs. Adult male mammoth tusks normally weigh 80 to 120 lbs. and occasionally over 200 lbs.

The color of mammoth ivory varies from off white to chocolate brown internally. Almost all A-grade mammoth is off white or yellowish white in color. Bark ivory, which was in contact with the soil, is usually brownish in color and the color can be on the surface or quite deep. The blue color on the surface is some of the bark ivory is caused by vivianite, a phosphorous mineral, most likely derived from the soil from which the tusk was buried in.

The U.S. Fish and Wildlife Service has determined an easy way to distinguish mammoth ivory from modern elephant ivory making it possible to transport the material or finished products across international borders. If one cross cuts mammoth and elephant ivory and sands and polishes the cut surface a distinctive crosshatch pattern in the ivory will be evident. If the angle of the cross hatches is less than 90degrees the ivory is mammoth, if the angle is more than 90 degrees the ivory is elephant.

### **Proper Curing of Ivory**

Old Walrus ivory and Mammoth ivory contains 15-20% excess moisture when it initially comes out of the ground and it is important to cure the ivory properly to minimize cracking. Old Walrus ivory is dried slowly in plastic containers with lids in a cool outside storage location. Approximately every 2 or 3 months the ivory is oiled with mineral oil or baby oil to inhibit cracking.

Mammoth tusks and sections of tusks are cured in a cool outside building. The cut surfaces of the mammoth tusks are coated with white Elmer's glue and hose clamps are placed every 6 to 12" along

the tusk. As the mammoth ivory dries the hose clamps are tightened every 2 to 4 weeks. Eventually, the hose clamps will not tighten indicating the tusk is dried. Drying time takes 1 to 3 years depending on the diameter of the tusk. A-grade Mammoth ivory dried too fast in an inside heated environment will usually have one to several internal cracks, not evident until sawed. If properly cured A-grade Mammoth ivory can be sawed into knife handles or other dimensions with minimal warping or cracking. Wet or uncured Mammoth ivory will normally warp excessively unless placed in a vice or clamped securely while drying.

Bark Mammoth ivory separated from the tusk will dry adequately in 2 weeks to 2 months depending on the thickness. Wet bark ivory cut into knife handle scales will warp about as much as uncured A-grade mammoth but this can be minimized as well by clamping or placing in a vice.

If Mammoth ivory is properly cured I do not personally believe that it is necessary to chemically stabilize the material but other people think differently. Since ivory breathes, that is, it expands and contracts with changes in humidity, it may be advisable to chemically stabilize your material if you are unsure.

All finished ivory products, including knife handles, require proper care. In general, that means keeping carvings or knives in storage cases with a container of water to maintain constant humidity and occasionally wiping the ivory product with non-drying oil. Non-drying oil is mineral oil or baby oil.

Ivory that has been buffed with buffing and polishing compounds is sealed and will breathe much less than non-buffed ivory. In the case of a knife handle the back of the scale should be sealed with loctite, superglue or epoxy and the ends, sides and face should be buffed and polished to minimize movement, cracking or breathing. Even knives with properly prepared ivory handles should be stored in cases with constant humidity and oiled occasionally.

## **Working with Fossil Ivory**

### **Cutting Ivory**

Since most fossil ivory has been preserved frozen in the ground for thousands of years, it cuts and works much like fresh ivory with one exception. Some of the oldest Beach Walrus ivory is partially fossilized and is harder than dug Fossil Walrus ivory or Mammoth ivory to cut. However, even the hardest beach ivory is easily cut with a hacksaw, coping saw or band saw. Lapidary saws are not necessary. I use a band saw with metal cutting blades with 5 to 14 teeth per inch. The wetter or more oiled the ivory is, the easier it cuts. I commonly cut up B and C grade mammoth ivory when it is wet into sections 4 to 12 inches long and allow them to dry rapidly so that the bark and rings of inside ivory separate from each other.

### **Sanding and Polishing Ivory**

Practically every ivory worker has their own process to sand and polish ivory. My method is to start with 80 grit, then 180, then 360 grit with a belt which is mostly worn out. Generally, fine scratches can be buffed from the ivory after using 220 to 240 grit sandpaper. However, the finer the sanding, the easier it is to buff and polish the ivory.

After sanding from 240 to 400 grit I buff the ivory with White Diamond Buffing Compound. Don't force or press too hard, but just allow the buffing compound to do the work. Apply fresh buffing compound often. The final polishing/buffing is done with Fabuluster, although you may find that this is not necessary since a very good finish can be achieved with White Diamond alone.

### **Repairing Cracks**

Walrus tusks have stress cracks, as mentioned earlier, and mammoth bark ivory usually has small hairline cracks, especially the oldest, most colorful material. All ivory workers are accustomed to repairing cracks as they are encountered while working with fossil ivory or doing small crack repairs to previously finished products.

Everyone who I have talked with uses superglue and superglue catalyst. The superglue comes in different thicknesses with different drying times and is marketed under a variety of brand names. It can be purchased from knife maker supply catalogues, hardware stores and from most craft stores. I purchase a medium thickness superglue called Zap A Gap and its chemical hardening catalyst, Zip Kicker, from a local craft store.

The crack can simply be filled with superglue and allowed to dry without the use of a catalyst. It may be necessary to apply the superglue several times to fill the crack. If the crack goes through the ivory it may be necessary to cover the back of the crack with a piece of tape to prevent the glue from dripping out. After the crack has been filled and the glue is dry the ivory can be sanded and polished. The hardened superglue will take a polish just like the adjacent ivory. If you are in a hurry or don't want to wait for the superglue to harden by itself, spray the superglue with the catalyst and it set up almost immediately. However, too much catalyst may cause the glue to become whitish instead of clear making the repaired crack easier to see. It's something you will have to work with to find how much catalyst is too much.

The second approach is to apply the superglue to the crack and sand lightly mixing ivory dust with superglue. The heat from the sanding action will harden the glue. A dremel tool or foredoom tool with the 1 to 1 ½ " sanding discs is much easier to do this with than a large sander. It takes a little more skill to repair a crack this way but the results are better. A crack repaired this way is often undetectable.

## **Fossil Ivory as a Knife Handle**

Fossil ivory is a warm tactile material and, when utilized as a knife handle, will enhance the beauty, value, and collectability of the finished product. Since each piece of fossil ivory is unique, it is virtually impossible to get two handles that are identical. Both Fossil Walrus and Mammoth ivory can be utilized for scale type handles. Fossil Walrus ivory is more commonly used for hidden tang type handles but A-grade Mammoth can be used also.

The beauty and value of fossil ivory knife handles can be enhanced by scrimshaw, relief carving, or embellished with gold or precious gemstones. Fossil ivory can be combined with hardwoods, bone, stone or other natural materials to achieve desirable results.