How to Age Harvested Game Mammals

By Henry Chidgey - CoFounder Wildlife Analytical Labs July 2012 Revision
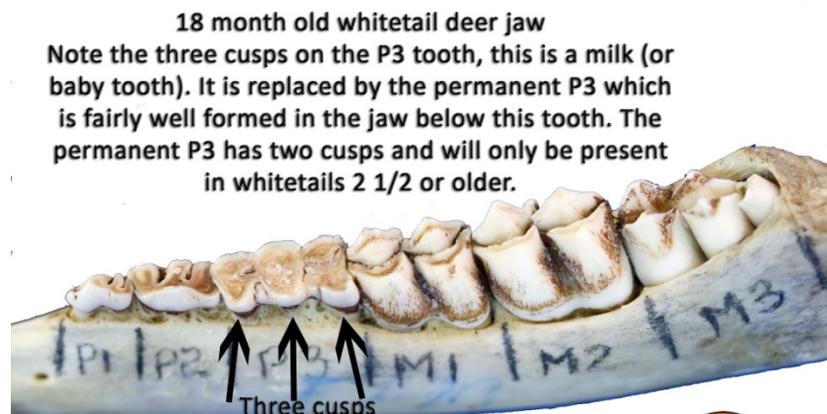
Any of us that are at all involved with trophy game mammals are frequently asked "How old do you think he was?" The purpose of this article is to look at the current science and also the mythology surrounding the ways to find an answer to this ongoing question.

The most accurate method to know the age of a game mammal is to apply a tag to the animal's ear at birth or insert an electronic chip under the skin. Unfortunately, at least from the point of view of accurately knowing the age, this method does not work for most of us.

The next most accurate method is nearly as accurate as tagging at birth to determine age, but only applies to younger age classes of game mammals. This method is called tooth replacement or eruption aging. The science behind this approach is based on the fact that most game mammals (and humans too) have a very predictable pattern in which their original or milk teeth (baby teeth in humans) are replaced by permanent teeth that stay with the mammal through their life. To illustrate this method I will use the example of a whitetail deer, probably the most prevalent big game mammal in the world.

A whitetail's teeth come into its mouth in a very predictable way in the first two years of its life. We can tell by the number of teeth in the side of the jaw, for sure, whether the deer is about six months old, eighteen months old, or 2 ½ years old or older. The reason I refer here to age in ½ year increments is that nearly all whitetails in the northern hemisphere are born in the spring and harvested in the fall. The way to do this is:

a. If the jaw has 4 or 5 teeth the deer is 6 months of age (It was born the previous spring).

b. If the jaw has 6 teeth we know for sure it is at least 18 months old. If the third tooth from the front has three cusps it is for sure an 18 month old deer. You can remove the flesh and see the permanent teeth underneath the milk or baby teeth (though this is not necessary to be certain, you just need to see the three cusps and six total teeth). This age class is most often misjudged as being a very old deer. The reason is that the third tooth from the front almost always is heavily worn (though it is a baby or milk tooth).

18 month old whitetail deer jaw
Note the three cusps on the P3 tooth, this is a milk (or baby tooth). It is replaced by the permanent P3 which is fairly well formed in the jaw below this tooth. The permanent P3 has two cusps and will only be present in whitetails 2 1/2 or older.

However, once a hunter, wildlife steward understands and learns about this eruption schedule it is easily identified from then on.

    c.   If the jaw has 6 teeth and the third tooth from the front has two cusps, the deer is 2 ½ years or older. If all the teeth are very sharp (no wear at all) it is safe to call it a 2 ½ year old. If there is any wear on the molars (the back three teeth) then you know the deer is at least 2 ½ but not certain beyond that.
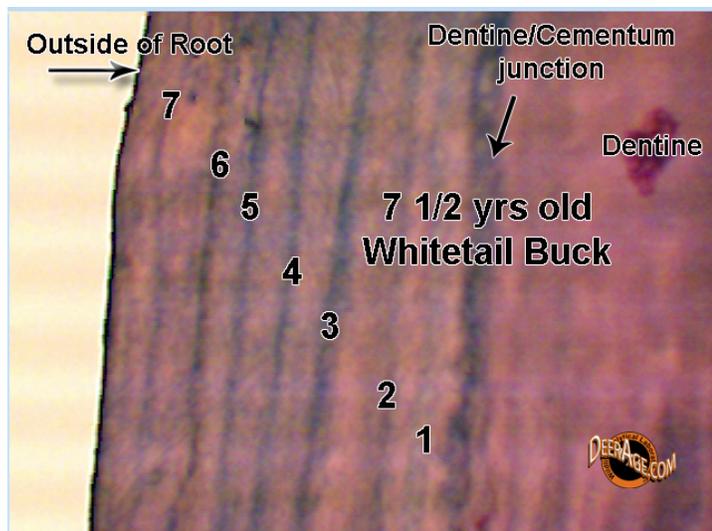
That is the limit of information about age that is available with eruption aging. This type of aging methodology is similar with other game mammals, only differing in the details. If you want to know more about the age other than "it is 2 ½ or older" you will have to use the next method we talk about here.

This next method is called cementum annuli (pronounced Ann-u-lie). Every year any mammal has a tooth in its jaw; there is a layer of something called cementum deposited around the root of the tooth below the gum line. These layers around the root of a mammal's tooth are analogous to the growth rings on a tree. One layer or ring for every year of growth (tree) or year in a jaw (mammal). When it comes to aging mammals you also need to know the physiology regarding tooth replacement for that particular mammal. For instance if we were looking at one of our teeth (like our lower center incisor) we would need to add 6-7 years to the number of cementum rings we counted to determine our age. The length of time we had a baby tooth in this location will not be recorded in cementum layers on the

Two Center Incisors

permanent tooth that replaces it. Fortunately there are laboratories that do this type of forensic histological work. For $25 or less someone can submit the two center incisors from their trophy mammal (somewhat more expensive if using a molar) and know the age.

What happens in the lab is that they take one of the two teeth and place it in a buffered acid solution until it changes from being bone like in consistency to something more like a hard pencil eraser. Then the top of the tooth is removed and the root is encapsulated with histological grade paraffin. The tooth is then sliced using a microtome until several very thin slices from the center of the tooth root can be placed on a slide. After several steps to remove residual paraffin the slices are stained and then viewed with a microscope at about 150X magnification. The number of cementum lines are counted and based on the species and type of tooth the age is discovered. For instance if the histologist counts 3 cementum lines or rings and the tooth is a center incisor from a whitetail the age is 3 ½ years. If it was the same tooth from a mule deer, it would be 4 ½ years old. In a study done by Kenneth L. Hamlin et al. of

Outside of Root / Dentine/Cementum junction / Dentine / 7 1/2 yrs old Whitetail Buck / DEERAGE.COM

the Montana Fish, Wildlife, and Parks (Journal of Wildlife Management 64(2):441-449) accuracy rates of cementum annuli were 97.3% for elk through age 14, 92.6% for mule deer through age 14, and 85.1 % for white-tailed deer through 9 years old.

This is probably a good time to bring up one of the most popular and prevalent myths of how to age game mammals, molar wear aging. This technique suggests that we should be able to determine the age of a mammal by looking at the wear on the molars. Sort of like determining the age of your tires by tread wear. In the same study by Hamlin referred to above; the accuracy of molar wear aging was 62.3% for mule deer, 42.9% for whitetails, and 50% for elk in the 3-4 year classes, 16% for elk 5 years old. They ultimately concluded that "The accuracy provided by the cementum annuli method is necessary to determine whether various physical and population parameters change significantly with age of the animal." So what is the source of this popular myth of molar wear aging? In 1949 Wildlife Biologist C.W. Severinghaus published a study "Tooth Development and Wear as a Criteria of Age in White-tailed Deer" Journal of Wildlife Management 13:195-215. In this study he suggested two methods of aging; Eruption or tooth replacement aging and Molar wear aging. Subsequent studies since 1949 have supported his eruption aging results, but no study has been able to validate his hypothesis concerning molar wear aging. In fact in addition to the Hamlin study cited above here are some more comments by wildlife biologists in recent years:

a) ….this widely used technique (molar wear) is very inaccurate for classifying adult deer…. (Ken Gee, Wildlife Biologist, Noble Foundation Wildlife Unit 1996 study)
b) We believe age-specific information and conclusions drawn….using the tooth-wear aging technique to "determine" ages of adult white-tail deer are unfounded…Review of all other published data sets using known-age deer supports this conclusion.(Wildlife Society Bulletin 2002, 30(2):387-393 Ken Gee et al.)
c) Ages assigned by … wear criteria were not reliable….. (Kenneth Hamlin et al. 2000 Journal of Wildlife Management 64(2):441-449)
d) ….we conclude that tooth replacement and wear should be used for deer $\leq$2-1/2 years old, while cementum annuli should be used for deer $\geq$3-1/2 years old. (Mickey W. Hellickson, Ph.D. King Ranch Chief Wildlife Biologist 2007)

Curiously this molar wear aging is still part of the course curriculum taught to current wildlife biology students. That is probably a key reason that the myth continues.

In conclusion, if someone wants to really know the age of mature trophy game mammals, the only choice is cementum annuli aging which can be accomplished by Wildlife Analytical Labs www.DeerAge.com in Burnet, Texas for around $25/animal. Call (512 756-1989) or email (customerservice@DeerAge.com) for more information.

WAL also offers a "Prepaid Forensic Lab Test & Deer Aging Kit" that in addition to a prepaid analysis comes in a DVD type case that includes simple to fill out prepaid order form, small envelope with lining to hold the two center incisors, a large mailing envelope to send it all to the lab, and eleven highly detailed photos showing exactly how to quickly and easily remove these two teeth with only a pocket knife.