

## Lab Exercise: Dem Bones

(Adapted from France, D.L. 2004: *Lab Manual and Workbook for Physical Anthropology*, 5<sup>th</sup> Edition)

### INTRODUCTION

Forensic physical anthropologists specialize in the research and application of techniques used to determine age at death, sex, population affinity, stature, abnormalities and/or pathology, and idiosyncrasies to (usually) modern skeletal material. In keeping with the holistic nature of anthropology, forensic anthropology incorporates information and techniques from fields such as anatomy, physics, chemistry, pathology, law enforcement, and others. The techniques used in forensic anthropology are often used in describing non-forensic cases, such as archaeologically-derived specimens, but that use, strictly speaking, is not forensic anthropology. The term "forensic anthropology," in a strict sense, can be used to describe any situation in which the techniques of any aspect of anthropology are applied to the law.

Forensic anthropologists often work with coroners and medical examiners in the identification of individual skeletons in which the identity of the remains cannot be established by other means (dental identification, fingerprints, or DNA, for instance). Those remains do not have to be skeletonized in order for skeletal clues to be useful, and frequently forensic anthropologists are called to assist with decomposed, burned, or fragmentary remains. Forensic anthropologists may be called to assist in the recovery and identification of remains from mass fatality incidents, including plane crashes, building explosions, and other circumstances in which the remains are fragmentary and commingled (remains from one individual mixed with those of other individuals).

Once the remains have been uncovered, a series of questions must be asked, and a set of procedures followed in order to establish critical pieces of information about the individual. The first of these is whether or not the remains belong to a human. If the remains are human, then determining sex, age, ancestry, evidence of trauma, or any other personal identification markers is conducted.

Clearly, the methods and techniques utilized by forensic anthropologists can assist in the assessment of various features of hominid anatomy, locomotion, diet, disease, and behavior that helps paleoanthropologists get a better sense of the overall lifeway of our hominid ancestors, be they 5-6 million years old, or 45,000 years old.

The purpose of this lab exercise is to give students practice in identifying skeletal features used for determining sex.

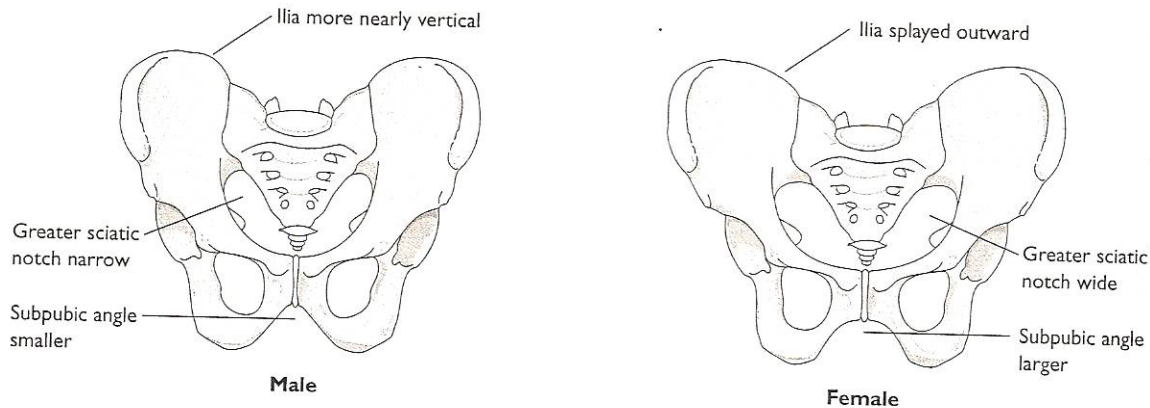
### Part One: Determination of Sex

Humans belong to a species that exhibits **sexual** dimorphism, notable physical differences between the sexes that are not related to reproductive traits. In general, males tend to be bigger than females: the bones are larger and the areas devoted to muscle attachment are larger and more rugged, just as in other primate species, most notably gorillas and orangutans, and in many other mammals. However, to use this size difference in sex determination, the researcher must be able to identify the population from which a skeleton came, as populations differ in average skeletal size and degree of sexual dimorphism and proportions.

The most reliable area for the determination of sex is, as one might guess, the pelvic girdle. This is the one area of the body for which a sexual difference has clear natural selection

ramifications, for the if the birth canal is not large enough in females for the fetus to pass, the infant will die (and perhaps the mother as well), and the genes from the parents will not be passed on to the next generation. Other clues in the skeleton (when available) must not be overlooked in determining sex.

Look at the illustration below. Note the differences in the male and female pelvises in the key areas identified in the illustration.



1. Go to the lab table where two pelvic girdles have been placed. Each one is labeled with a letter. Complete the table and then answer the questions that follow.

	Pelvis A	Pelvis B
Describe the size, shape and orientation of the ilia.		
Describe the sciatic notch		
Describe the size, shape and orientation of the sacrum		
Describe the angle of the subpubic arch		
Describe the shape and size of the pelvic opening		

Based on your observations, can you determine which pelvis is male and which one is female?

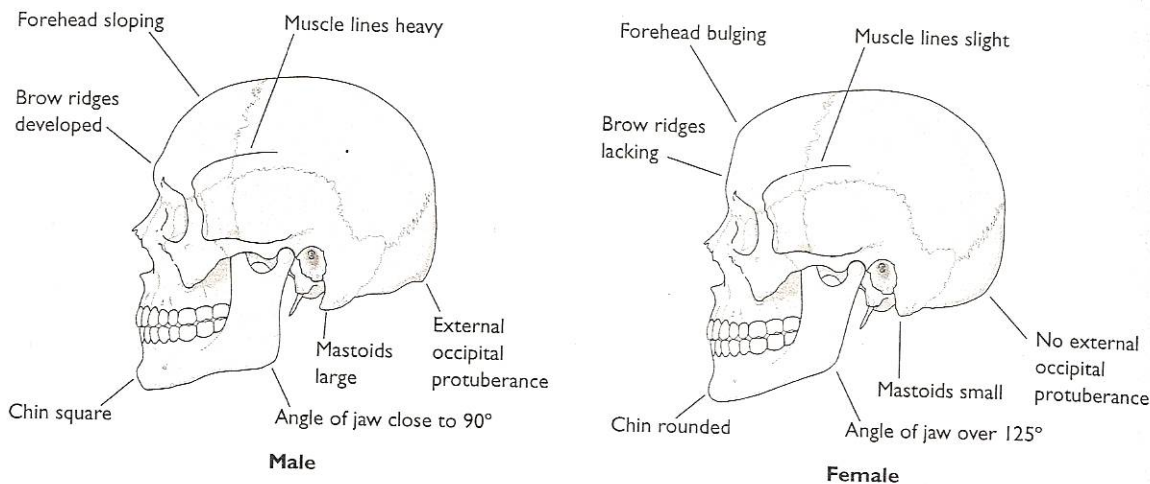
Pelvis A: \_\_\_\_\_

Pelvis B: \_\_\_\_\_

It has been widely taught that the second best area for sex determination is the cranium and that measurements of the postcranium should be used largely if the cranium and pelvic girdle

are not usable. If one knows the population from which a skeleton is derived, however, postcranial metric measurements can be highly reliable, but cultural practices and differences in muscle use can reduce the reliability of both cranial and postcranial dimorphic differences. For instance, a female who lifts heavy weights will show less difference from a male who sits behind a desk and does not heavy lifting in upper arm measurements. In a culture in which burden baskets are carried on the female heads, the size of the female mastoid process will increase so that a population would show less dimorphism for that trait.

Look at the illustration below and your handout “Comparison of Male and Female Skulls” which accompanies this lab exercise.



Then, go to the lab table where the male and female skulls have been placed and answer the following questions based on your observations. (Refer to the handout with the highlights for specific cranial features that is at the lab table)

1. First, note the differences in overall size, shape, and robustness. Which skull appears to be larger and more robust?

2. Then, compare foreheads (it's best to look at the profile):

a. Describe the forehead:

Skull A:

Skull B:

b. Describe the supraorbital ridge (browridge):

Skull A:

Skull B:

3. Next, compare the jaws:

a. Describe the chin:

Skull A:

Skull B:

b. Describe the angle of the mandible (lower jaw):

Skull A:

Skull B:

4. Now, look at the area where the ear once was:

a. Describe the mastoid process.

Skull A:

Skull B:

b. Describe the zygomatic arches, paying close attention to where they end on the temporal bone:

Skull A:

Skull B:

5. Finally, compare the cranial bases:

a. At the base of the skull, feel the bottom and describe if the nuchal ridges (where the neck muscles attach) are rough or smooth:

Skull A:

Skull B:

b. Is there a bony projection in the middle of the occipital bone (back bone of skull)?

Skull A:

Skull B:

Based on your observations, can you determine which skull is male and which one female?

Skull A = \_\_\_\_\_ Skull B = \_\_\_\_\_

6. What are three ways to tell male from female skulls?

a.

b.

c.

7. What are three ways to tell a male pelvis from a female pelvis?

a.

b.

c.

### **Part Two: Identifying disarticulated bones**

The ability to identify disarticulated human bones is an essential skill for paleoanthropologists who work with the usually fragmentary remains of human ancestors. Unlike other primates, we can maintain a fully upright, two-legged posture for hours, leaving our arms and hands free for other tasks---a feature which gave humans an evolutionary advantage over the apes, like our characteristic precision grip (made possible by the long, very mobile thumb). As you know, the main limbs used in locomotion are the legs. Compared to the bones of the arm, the bones of the human leg are thick and strong, to carry the body's weight. Thus, most of the major differences observed in the hominid skeleton are related to our bipedalism. This portion of the lab will give you further practice in identifying and distinguishing between the limb bones.

➤ Go to the table where the postcranial bones have been placed. Each bone is labeled.

1. List the bones (by the tag letter/number) that you think are the bones of the arm.

2. List the bones (by the tag letter/number) that you think make up the leg.

3. Now, see if you can locate the following bones:

<u>Bone:</u>	<u>ID#:</u>
Humerus	-----
Radius	-----
Ulna	-----
Femur	-----
Tibia	-----
Fibula	-----

4. Check your answers with your instructor. List any bones that you identified *incorrectly* below. (If your identifications were correct, go to question 5)

5. List some features that are helpful in distinguishing between a *humerus* and a *femur*?

6. List some features that would be helpful for distinguishing between the *radius* and *ulna*?

7. What general statement/conclusion can you make about how to distinguish the arm bones from the leg bones based on your observations?